THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1735.] LONDON, AUGUST 11, 1896. [48TH YEAR. PRICE 6d.

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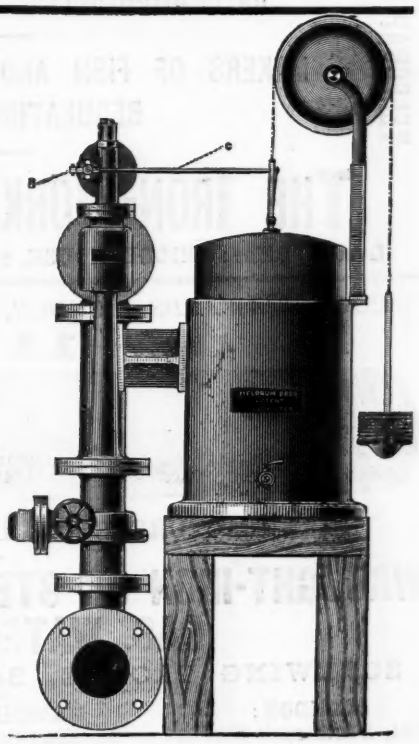

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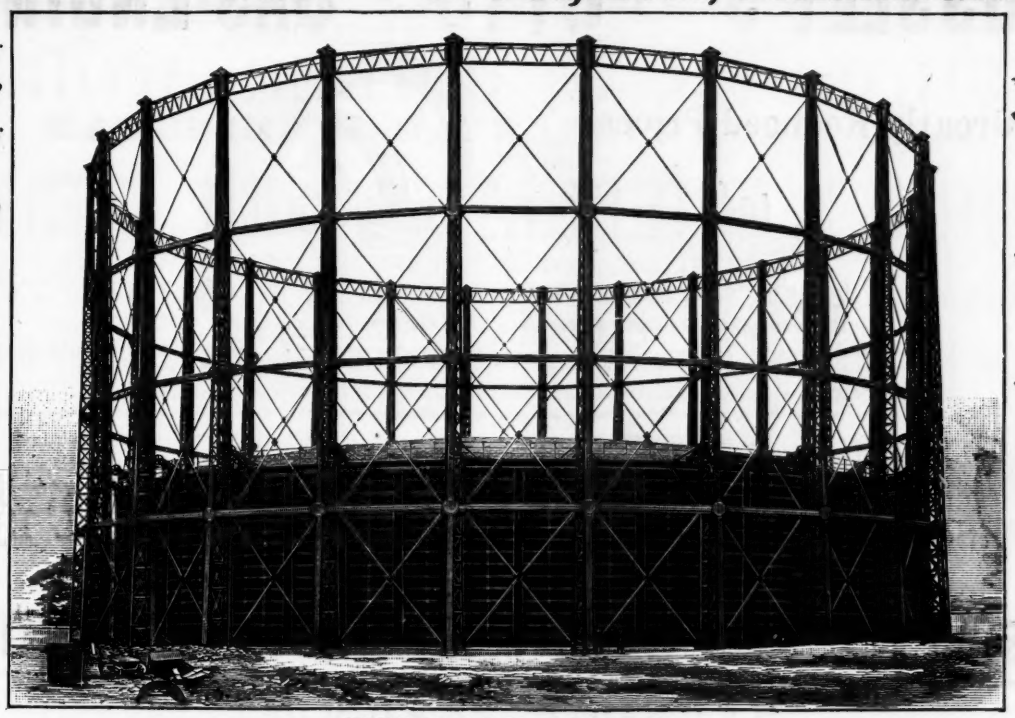

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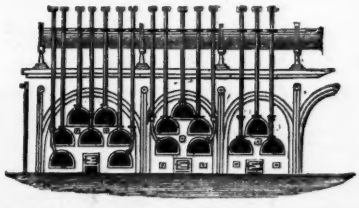

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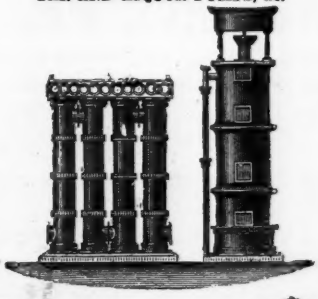

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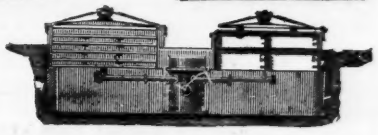

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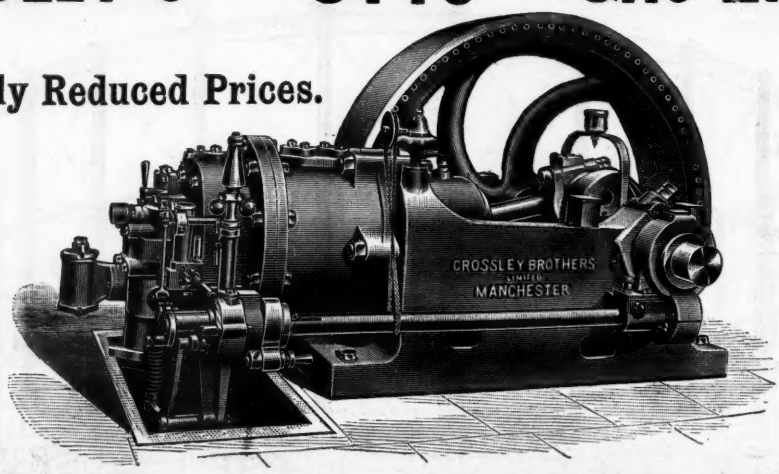

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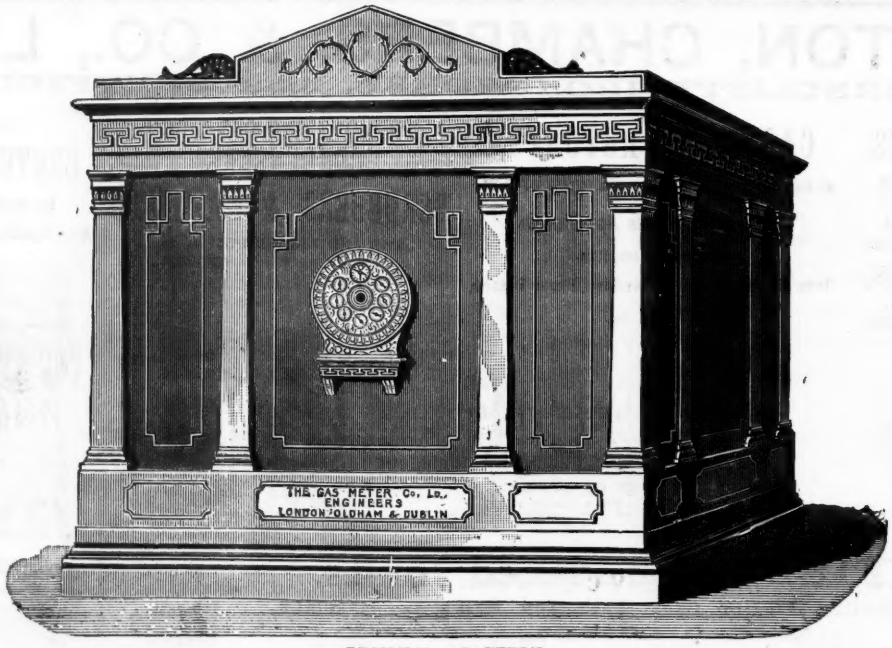

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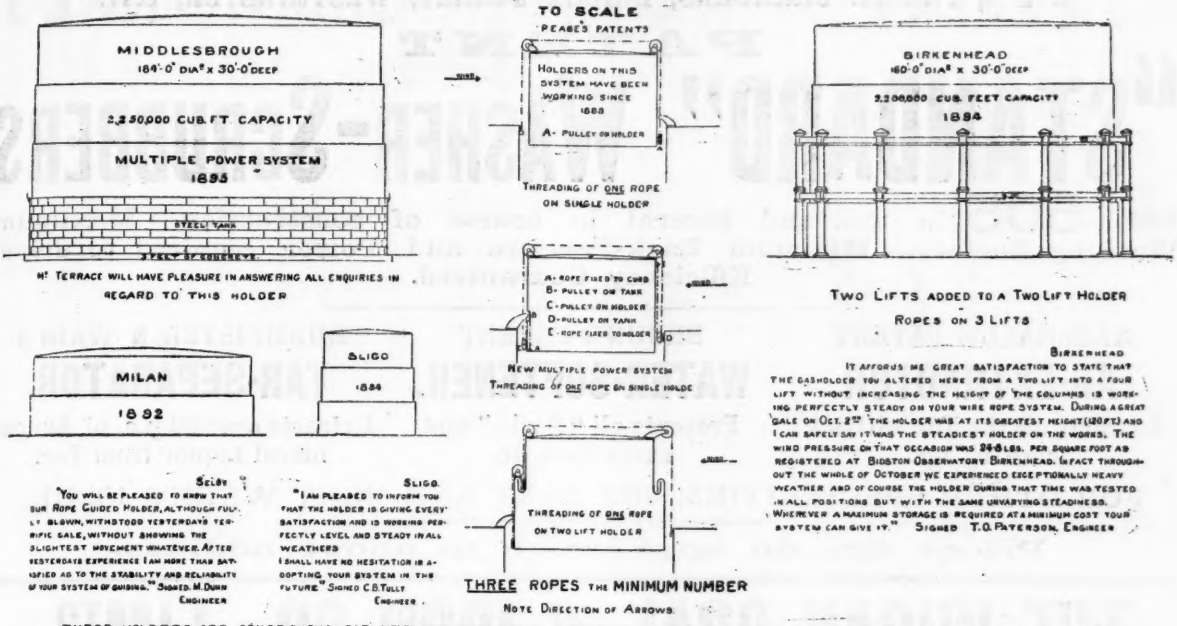

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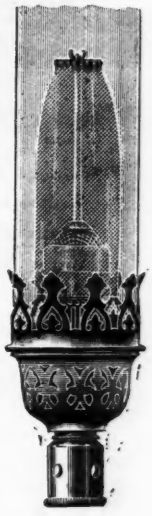

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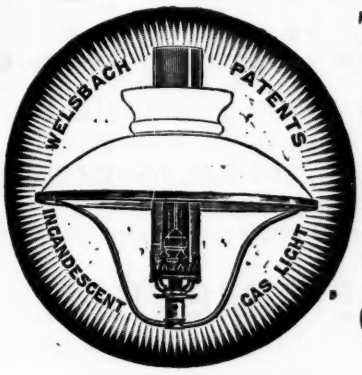

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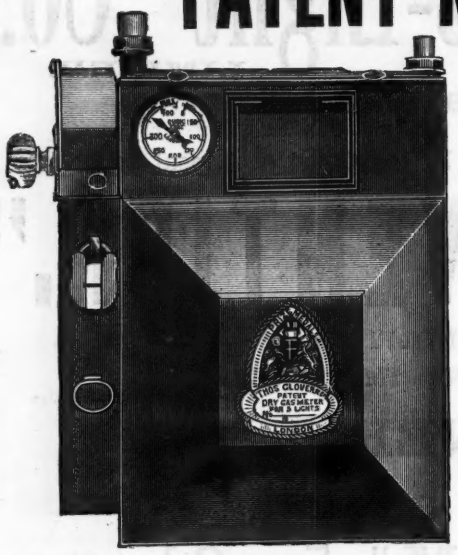

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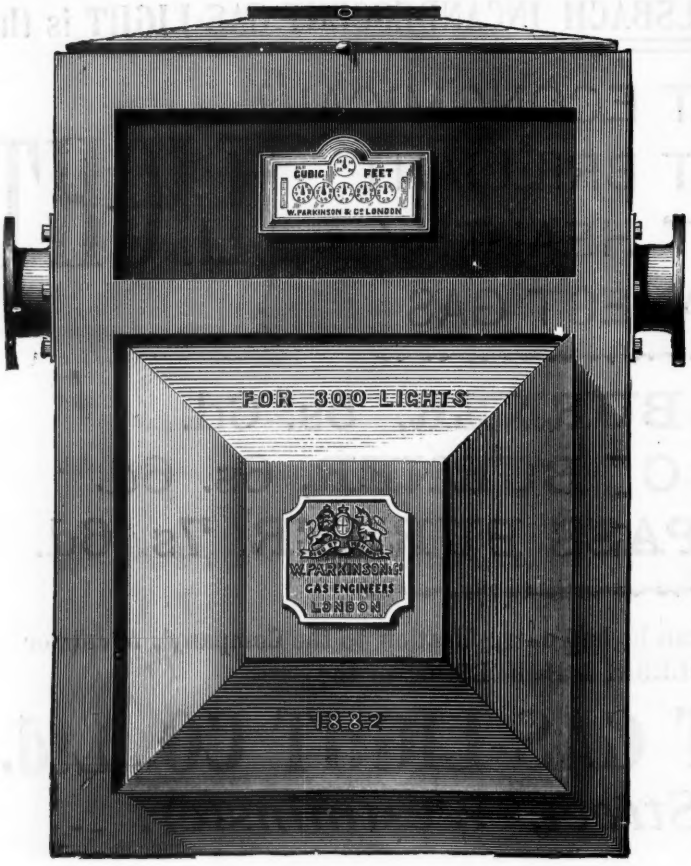

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The Gaslight and Coke Company's Meeting—Heading for Parliament.

THE general meeting of The Gaslight and Coke Company last Friday was fairly well attended, and passed off without incident. The Governor—Colonel Makins—presided, and delivered, in support of the report and accounts, a very carefully-prepared address, from which everything like his usual "breeziness" had been eliminated. Consequently, the speech fell flat, which was not altogether a disadvantage from the official point of view, inasmuch as it created an atmosphere of dulness unfavourable to lively controversy over the revelations of the accounts. Most of the Governor's speech was devoted to a laboured exposition of matters of small importance, such as the justification of the Company's charges to their consumers, and so forth. There has been a crop of complaints of large gas bills in the Company's district, which a section of the Press has commented upon with the usual plentiful lack of information respecting the whole subject of meter registration; and this minor point afforded the Governor a fine opportunity for avoiding the weightier problems presented by the Company's position, while riding off upon a quest for facts about meters from which he was certain to return in easy triumph. But it is not clear why the Company should spend £20,000, to say nothing of the cost of maintenance, upon a private meter-testing station, the existence of which will not satisfy a single consumer that his gas-meter is one whit better than it should be. The style in which the Governor made the announcement of this outlay was not calculated to reassure those who have seen in bygone times lavish expenditure treated by the Chartered authorities as equivalent to wise administration.

On the subject of the depreciated value of coke, the Governor could not say much more to the point than the statement offered in the Directors' report respecting the arrangements entered into for exporting it in bulk. The general desire of gas managers throughout the country is that all the Company's coke should be exported summarily, or sunk in the Beckton marshes, instead of being sent inland, as it is, to spoil local markets without conferring any corresponding benefit upon its producers. The exportation of it at the lowest of low prices may help to ruin the British cement manufacturer; but this process is capable of being carried on while Gaslight and Coke trucks are being sent to every railway siding in the South of England, where local dealers are able to dispose of the coke to the prejudice of the local Gas Company. It is the same with sulphate of ammonia in another way. The inability of The Gaslight and Coke Directors to strike a fair bargain and take a reasonable price when they could have had it, has destroyed the prospects of more Gas Companies than their own. If Colonel Makins and his head officer were to play the part of the Caliph of Baghdad and his Vizier, and make a tour of the best-managed gas undertakings in the kingdom, with the object of ascertaining in what esteem they are held on account of their dealings with residuals, they would hear something that might eventually be to their advantage.

As was to have been expected, the Governor said not a word with reference to the panic-stricken action of the Board at Easter in refusing new automatic prepayment meter supplies. Neither did he explain how or when the cost of carrying on this department of the Company's business is to be wiped out. The latter portion of the speech from the chair was, in point of fact, an obvious exercise in the art of skating on extremely thin ice. The dwindling of the Company's resources was not touched upon; and the utmost that the Governor could promise for the "immediate future" was that there would be no raising of the price of gas nor diminution of the dividend. As a proprietor afterwards remarked, there is a good deal in what meaning may be assigned to the word "immediate" in this connection. The Governor, however, having surmounted the difficulty of appearing to deal frankly with this all-important point without committing himself to anything definite that could be quoted against him hereafter, was not to be drawn again. We observed last week that we should be glad if it could be demonstrated at the meeting that the Company can continue to pay their way with gas at the present prices; but it must be regretfully placed on record that the Governor's speech does not contain any proof of this kind. The principal feature of the

meeting was something very different—being nothing else than the adumbration of the intention of the Directors to try their luck in Parliament with a stock-consolidation scheme as soon as they can prepare one. The Governor plainly hinted that they hoped to profit by the South Metropolitan Company's lead in the procedure; and to some extent he is justified in regarding this success as offering a promising opening for the Chartered to try for. It appears, however, that he will have to copy Mr. Livesey without having any claim upon the South Metropolitan Chairman's help; while his legislative programme will carry the additional burden of a demand for further capital. The Horseferry Road autocracy too deeply offended Mr. Livesey in setting at naught the wishes of their own proprietary on a memorable occasion, and striving after that historical "pound of flesh—blood and all," for him to place himself at their disposal in a parliamentary campaign, even if he does not appear on the other side. This is a consideration to which, of course, the autocrats in question may be sublimely indifferent; and, equally of course, we have no sort of warranty for mentioning it, beyond the general knowledge, which is not peculiar to us, of the state of relations between the Horseferry Road and Mr. Livesey. It will be curious to watch the development of the now inevitable progress of The Gaslight and Coke Company to Parliament. It is not a far cry, geographically, from the Horseferry Road to St. Stephen's; but it will nevertheless be a long and painful journey there and back for an undertaking situated as this is.

Another Lawsuit Concerning the Southwark Bridge Explosion.

It was reported in our "Legal Intelligence" last week that another claim against the South Metropolitan Gas Company in respect of the Southwark Bridge explosion had been before Baron Pollock and a special jury, with a result that appears to satisfy the ends of justice more perfectly than the earlier proceedings which eventuated so strangely. The claim was contested by the Company solely on the ground of principle—the facts of the injury and its immediate cause not being contested. The plaintiff, however, sought to establish legal negligence against the Company; and this was the only point upon which the defendants pressed for judgment in their favour, in view of the momentous consequences involved. Counsel for the Company argued that it was for the plaintiff to prove that the gas-main from which the escape came that caused the explosion was not properly laid, and that reasonable care and diligence in maintaining it and discovering when anything was wrong with it had not been exercised by the Company. A good deal of evidence for the defence was laid before the jury; and they were very largely helped by the great common sense and forensic acumen of the learned Judge. It is impossible to lay down any general rule defining legal negligence. As the Judge said, there is an old illustration to this effect which declares it to be unreasonable that a man should be required to take his carriage to pieces every time before going on a journey in it, to make sure of its being all right. Similarly, a gas company cannot reasonably be expected to be always probing about their mains, so as to assure themselves of the absence of leaks. All such a company can be required to answer for is that they should have done what any reasonable man, guided by those considerations which ordinarily regulate the conduct of human affairs, would do, and should not have done what a reasonable and prudent man would refrain from doing. These are, as the Judge admitted, somewhat vague, if sound and clear, propositions; and, after all, it is for a jury to declare, in regard to a particular instance, whether these general conditions have been complied with or not. It is not enough to say that, inasmuch as an injury has been caused, there must have been something wrong which ought to have been guarded against. This is a very natural inclination of the human mind, always apt to manifest itself in the face of a disaster which might possibly have been prevented if everything conducive to it had been known beforehand. Such perfect prevision, however, is not required by the ordinary conditions of human life, which would be impossible unless an infinite number of things could be taken for granted; and it is satisfactory to learn from the case in question that the law agrees with common experience in this respect. The whole report is worth reading, as a lesson in the interpretation of that sometimes abused common law of England which is nevertheless one of the glories of the land.

Waste in the Kitchen.

The state of affairs existing in that part of London served by the East London Water Company is not, of course, to be discussed here; but the torrent of contumely that has been poured upon the unhappy Company in the newspapers and elsewhere is deserving of passing notice, as an example of the inability of public speakers and writers to observe the Ninth Commandment when the case is that of a statutory company. It would be precisely the same with a gas company if, for any cause whatever, the supply of gas were to be interrupted wholly or partially for more than a day or two. One of the best reports and most reasonable of newspaper articles on what is called, somewhat magniloquently, the "East-end "Water Famine," are to be found in "The Times" of the 3rd inst. In the article there occurs the following passage, which will awaken an echo in many breasts: "All who are "conversant with the habits of the poor know that waste "of everything for which they do not themselves pay "directly is second nature to them. Every mistress of a "house would declare that one of her troubles is to check "the tendency of her servants to waste gas, to waste water, "to waste coal, and to waste food; as if from a feeling "that the consequence of a household is enhanced by a "large expenditure in such matters." Speaking of the waste of gas, it is notorious that some householders have been driven to try the expedient of attaching a penny-in-the-slot meter to their gas kitcheners, and allowing the cook a certain sum in coppers to provide herself with gas, with leave to pocket what is not wanted. Little information is extant as to the results of such devices; but there is no doubt it is fear of the ingrained extravagance of domestic servants that really stands in the way of the more general adoption by householders of gas cooking-stoves. Perhaps after the small stoves that now go with the automatic prepayment meters into so many cottage homes have been in use for a decade or so, there may arise a generation of domestic helpers so habituated to the prudent use of these blessings of civilization, that they can be trusted with the gas-key as freely as the comparatively temperate servant of the present era is with that of the beer-cellar—which was not the case in our grandfathers' time. Human perfectibility, as many philosophers have observed, is a plant of very slow growth; and we must not expect the average domestic servant to attain as quickly as the gas-stove itself the desirable property of being able to "cook a dinner for a "penny"—as advertised. Perhaps the stove would do it; but the cook cannot.

Professor Ramsay on Coke Fires.

Professor W. Ramsay has been discoursing of late before the British Institute of Public Health on the hackneyed subject of smoke prevention; but it must be conceded to his honour that he did not deal with the question in a conventional or superficial manner. Speaking of smoky factory chimneys, Professor Ramsay admitted that selfish interest cannot be successfully invoked to induce the manufacturer to burn his coal smokelessly. This was one of the weaknesses of the once-fashionable party of *dilettante* smoke-preventionists, who held exhibitions and delivered speeches to Lord Mayors and other social eminences with the object of rendering it felony to own a smoky chimney. They professed with one breath that there was an enormous saving to be realized from burning coal smokelessly, while constrained to admit later that for many purposes there is no other way of burning it. Professor Ramsay knows better than these amiable enthusiasts; and he attacked the problem on other lines. While it is true that in the arts there is no appreciable economy in burning coal smokelessly, it is equally correct that this can usually be done by taking a little thought, and without extra expense in the long run. It is just the case, therefore, for the administration of gentle, steady compulsion to the latter course, in the interest of the public. With regard to that troublesome offender, the domestic fireplace, Professor Ramsay very reasonably says a good word for the French coke-stove, which can be had in many patterns, and is not unknown in English households, especially among the professional classes. This apparatus is all that Professor Ramsay claims for it as an economical warming appliance; but it is, of course, open to the familiar objection to all close stoves, and, on account of the fine ashes, is not so cleanly in use as might be desired. The Professor, however, went on to suggest that people might be induced to burn coke

in common grates if it were lighted by a gas arrangement —the once well-puffed device of Dr. Siemens, in short. Unfortunately, experience does not bear out this idea. Common grates are not well adapted for burning coke, however it may be lighted. They can be made so easily enough by deepening the bed of fuel that they are capable of holding, which is cheaply done by the insertion behind the bars of a high wire basket. There is no need whatever to have recourse to any patented article to secure this advantage, such as it is; but even when all is done, the average householder who can get coal will never burn coke in his living or sleeping rooms. He does not like it; and it is proverbially useless to dispute over a question of taste. Moreover, there are grounds for his dislike, which it is idle to ignore. A coke fire must be kept in full blast, in order to do which the grate needs very frequent attention; or it will die down and go out—presenting in this stage one of the dingiest spectacles a fireplace can offer. Besides, coke ashes are extremely fine, non-coherent, and light; so that they make a terrible mess wherever produced. It is useless to blink these facts, or to fondly imagine that the coal fire can be beaten out of English and Scottish homes unless by something which is better than itself in every respect—and this will be hard to find. For all this, there is plenty of room for coke and gas fires; and the use of these fuels will probably increase faster than the domestic consumption of coal.

The Lesson of the International Workers' (?) Congress.

The sorry farce of the so-called International Workers' Congress of 1896 came to the very tamest of conclusions in due course, after it had exhibited to an amused and contemptuous world an edifying forecast of what would happen if the actual springs of industry were remodelled to please the Socialists, and the established system of law and order abolished to suit the Anarchists. The appearance of the latter element on the scene has perhaps done more to disgust the real workman contingent in the recent show than any amount of argument proceeding from what they would deem interestedly antagonistic sources. For there were actual working men at the congress; and, by all accounts, they went away early, with anything but a high opinion of the well-to-do professional minority and the foreign revolutionaries whose extravagances turned the gathering into a modern edition of Bedlam. Curiously enough, there are not a few educated young people of both sexes among us who have taken up Socialism. They call themselves Fabians; and the young ladies are mostly followers of the journalistic persuasion represented by the "Daily "Chronicle" and a few cheap evening newspapers and weekly periodicals. These ladies and gentlemen, being unable to abandon the habit of washing, and, moreover, possessing the means of attiring themselves more or less fashionably, have lived to find themselves denounced in print on these accounts by those of their less fortunate "comrades" who fail to see why they should enjoy these personal luxuries at the expense of the enslaved multitude. The great and good John Burns was sage enough to keep away from the congress altogether; and he has since delivered himself of the opinion that it was the most gigantic failure of all "labour congresses" that have ever been held. Another professional gentleman—Mr. W. Stevenson—has put himself upon record, as the American language has it, as protesting against the futility of the whole thing. Perhaps the sole respectable bit of business done by the congress, carefully selected by "The Times" from the mass of visionary and not seldom contradictory resolutions passed by it, was a declaration impressing upon the proletariat the imperative necessity of learning how to administer the public business for the common good. Upon this it is remarked "the wording might be a little "changed, for it is not likely that the proletariat will be "called upon to administer the public business, and "still less likely, if we may judge from the proceedings "at the congress, that the public business would "be well administered if it were." Yet the spirit of the resolution may be understood to be "that speakers "at congresses and elsewhere ought to do what they can "to obtain at least an elementary knowledge of subjects "which they presume to handle; and that the structure "of society and the conduct of public business are not "quite such simple matters that every ignorant fellow is "qualified to lay down the law about them, and by the "sole light of nature to say in what they are defective, "and where and how they are to be improved." The recent congress supplied ample proof of the necessity that such a lesson should be learnt, and exhibited abundant illustration of the follies and absurdities into which they fall who would dispense with it. Meanwhile, one of the most significant of Socialist comments on the affair is that it would be wiser for Socialists and Trade Unionists to hold separate congresses in future. The former do not want the latter at any price, especially their own. The socialistic view of this matter is that they of the inner brotherhood may be ridiculous; but they are nevertheless sincere. It is also confessed that before the day of universal harmony and unity there will have to be some fighting. Coming after the Hyde Park resolution in favour of international arbitration, this is distinctly humorous.

WATER AND SANITARY AFFAIRS.

The "superfluous step" has been taken, and a deputation, overwhelming in numbers, however deficient in some other respects, has waited upon the President of the Local Government Board, to make certain representations with regard to the present condition of the water supply in the district of the East London Company. Mr. Chaplin's reply showed that he understood considerably more about the question than those who came to enlighten him upon it. The deputation asked him to do certain things. But, so far as these were practicable, they had already been done; and the things that had not been done were shown to be impracticable. The deputation gained nothing by their visit, except to learn something they might have been supposed to know before they came. If they relied upon statistics, so did Mr. Chaplin. They produced figures to prove that in Mile End the mortality from diarrhœa and gastro-enteritis was considerably greater in the fortnight following the reduction of the water supply than it was in the fortnight preceding. But Mr. Chaplin, fortified by the Registrar-General and "The Times," was able to show that in the third week since there had been a scarcity of water, the deaths from diarrhœa in Mile End had fallen from 20 to 10 as compared with the second week, although the scarcity was greater in the third week than in the second. For a sensational statement by a medical man at an inquest on a child, no foundation could be discovered. The doctor who made the statement had been written to, and Mr. Chaplin had been "waiting hourly" for the reply; but it had not arrived up to the time when the deputation appeared. The Company had also been written to, and their reply had been received, stating that the Medical Officer of the district in which the child died was surprised at the evidence given, and that he could not trace a case of either illness or death through the restricted supply of water. Mr. Chaplin has himself caused special inquiry to be made as to the alleged increase of sickness and an exceptional prevalence of diarrhœa owing to the restriction of the water supply; and the result has been an entire absence of evidence to show that the short supply of water has been the cause of any such increase. The same allegations were made under similar circumstances last year; and the Government inquiry which followed led to the same conclusion as that which Mr. Chaplin has arrived at in the present case.

Whatever may be the effect of an intermittent water supply on the health of East London, Mr. Chaplin reminded the deputation of certain facts which exonerate the Water Company from all blame concerning it. The responsibility rests where it was placed by Mr. Mellor when Parliament rejected the East London Bill of 1893. Warning was then given by the Chairman of Committees as to the consequences that might ensue; and the prediction has been fulfilled. Mr. Chaplin told the deputation there could be "no reasonable doubt" that, if it had not been for the action of Parliament in 1893, the increased means of storage required by the Company would have been completed by this time; and he was advised that the result would have been a continuance of the constant supply at the present moment, notwithstanding two years of drought. That Parliament should thus have interposed to the prejudice of the public health, is only to be accounted for by the influence of the County Council in the House of Commons. It is at once

interesting and humiliating to look back and see how the present scarcity of water in East London, and the want endured last year, are results due to the skill with which in 1893 the member for Battersea brought in the Irish vote to promote the designs prevailing at Spring Gardens. In the following year, the House of Commons retraced its steps, but too late to prevent the mischief which has since come to pass. But "the immediate question," as Mr. Chaplin expressed it, is how to bring about an adequate supply as quickly as possible. This he declared was not a matter within his "absolute power." The deputation acted as if they thought otherwise, and as if Mr. Chaplin had only to demand the instant resumption of the constant supply in order to obtain it. But the President of the Local Government Board, however powerful in his official capacity, was not able, as he said, "to compel the rain of "heaven to descend." He "wished it was;" and all he could do in that direction was to watch with anxiety the daily forecasts of the Meteorological Department. The question was "full of difficulties," and called for the best efforts of all concerned. The consumers, he observed, would act wisely and well if they avoided waste in their use of water. As for himself, he promised that nothing should be wanting to bring about, at the earliest possible moment, a happier state of things. Throughout the crisis, the East London Company had responded "most readily" to every suggestion he had made.

One public service has been rendered by the Toynbee Hall deputation, and that has been to afford the President of the Local Government Board an opportunity of giving to the world a clear and impartial exposition of the water question as allied to the present state of affairs in the district of the East London Company. The statements thus made are in full accordance with the independent testimony of a special correspondent of "The Times," who has visited the district and personally inquired into the facts. Letters from Mr. Crookenden must also carry weight, as narrating facts which come within his knowledge as the Company's Secretary. A letter addressed to Mr. Herbert Robertson, the member for South Hackney, by Mr. Bryan, the Engineer of the Company, has appeared in "The Times," in reply to a suggestion that a supplemental supply should be obtained from the Grand Junction mains. Mr. Bryan gives a very striking account of the extraordinary efforts put forth to execute the works authorized by the Company's Act of 1894. Making a reservoir is something more than digging a hole. Few people would imagine that nine miles of railway, of the full ordinary gauge, have been in operation for the purpose of executing works which are simply an extension of those previously existing. Mr. Bryan is confident that if Mr. Robertson would go and see the magnitude of the progress made, he would be "utterly astonished." It unfortunately happens that the nature of the London water-works is a matter very little understood or appreciated, even by our public men; and one thing demonstrated by the utterances of the recent deputation, is a singular want of acquaintance with the conditions of the Metropolitan Water Supply, as well as an inability to cast off fallacies already exploded.

PERSONAL.

Mr. J. W. Wilson, of Upton-on-Severn, has been appointed Manager of the Sandwich Corporation Gas-Works.

Sir A. Forwood, Bart., M.P., has resigned the position of Chairman of the Lighting Committee of the Liverpool Corporation, and is succeeded by Mr. C. Petrie.

The chairmanship of the County of London Sessions having become vacant by the retirement of Sir Peter Edlin, Q.C., Mr. W. R. M'Connell has been appointed his successor.

The two appointments of Superintendents of the Windsor Street and Adderley Street Gas-Works of the Birmingham Corporation, for which applications were invited in the "Journal" a few weeks ago, have been filled. Mr. T. F. Ennis, of Nine Elms, has been entrusted with the supervision of the first-named station; and Mr. E. Llewellyn Pryce, the Analyst and Chemist at Windsor Street, has been placed in charge of the second.

Mr. W. Grafton, who conducts the classes for "Gas Manufacture" at the Polytechnic, Regent Street, has just been presented by the students with a silver salver, bearing a suitable inscription, as a mark of their appreciation of his services. It is gratifying to find that the candidates who go up from this institution succeed so well at the examinations—having gained 25 per cent. of the first-class passes, as well as some in the second class; and, moreover, it is a testimony to the careful way in which they are prepared.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 284.)

In the Stock Exchange last week, things went from bad to worse. The markets opened after the holiday only half alive; and the attendance was so poor that everything drooped. But the downward course was more actively accelerated when the American market went all to pieces, and Capel Court was powerless to stem the torrent of sales in Wall Street. The failure of some large speculators in Chicago set it going. But the source of the weakness is the Silver Question; and, if the Silverites should carry the presidential election, the position will be serious indeed. Other depressing influences also dragged prices down—Turkish affairs, Spanish affairs, &c., which we have space only to mention. In sympathy with the prevailing tendency, markets not directly affected lost ground; and thus, throughout the list of the principal departments, there is a general shrinkage in value. The exception to this rule is to be found as usual in the Gas Market, where, also as usual, further improvements in price are to be found, and unattended by any retrograde movement. In Gaslights, business in the "A" stock was very moderate, and at one time it seemed scarcely so strong as it had opened; but it closed steady and unchanged. The secured issues were very firm. Perhaps to the market operator the most interesting item in the Governor's speech at the general meeting was his announcement that he hoped the Company might follow the example of the South Metropolitan Company in the unification of their stocks. South Metropolitan had a great rise in all three issues. A fortnight ago, we said the price might be called "anything in reason;" and that is the real position. The conversion of the capital takes effect as from to-morrow; and henceforth the capital will be consolidated 4 per cent. stock, with an authorized dividend of 5¼ per cent. at the present selling price of gas. Commercials were quiet and buoyant at a moderate advance. The Suburban and Provincial undertakings were extremely quiet, but full of rise; British and Crystal Palace adding to their recent gains. Croydon was dealt in two or three times, and looks like coming back into the list. The Continental Companies were unchanged—firm at the old figures. The rest presented no feature for remark. Business was very slack in Water, even for that usually quiet quarter. The general tendency was a weakness in the ordinary stocks, coupled with greater strength in debenture and preference issues.

The daily operations were: Gas reopened on Tuesday unchanged, and seemed likely to improve. End prices were the best, but quotations did not move. Transactions were decidedly limited on Wednesday, but important changes in quotations took place. South Metropolitan "A" rose 10½; ditto "B," 4½; ditto "C," 9½; and British, ½. In Water, East London 3 per cent. debenture gained 1. Thursday also was a rather quiet day; but further improvements were scored. Both Commercial issues rose 2; and Crystal Palace, 2½. In Water, East London fell 2; but Chelsea preference moved up 5. Friday was more active; and South Metropolitan "B" rose 3 more. In Water, Southwark fell 3; and Grand Junction, 1. Saturday was quiet; and Gas did not move. In Water, Southwark debenture advanced 5.

ELECTRIC LIGHTING MEMORANDA.

The Meeting of the Edison and Swan Company—Competition in the Lamp Trade—The New High Voltage Lamps—Lamp Prospects.

Considerable interest usually attaches to the ordinary general meetings of the Edison and Swan Company; and this year in particular the affairs of the Company are likely to attract a good deal of attention by reason of the state of the incandescent lamp trade at home and abroad. Fortunately, in Mr. J. S. Forbes the Company have a Chairman who can be trusted to make a good story out of any materials supplied to him from within or without the concern with which he may for the moment be identified; and accordingly his "Ediswan" oration was pointed, and eminently effective. It has been remarked in these columns on several occasions that the cheap and nasty incandescent lamps of the present day are among the greatest evils that have ever befallen the electric lighting industry; and curiously enough, this is the very time chosen by sanguine central station managers for endeavouring to force upon the public a system of electricity supply that makes more demands than ever upon the integrity of the incandescent lamp. Mr. Forbes began his speech at the recent meeting by referring to the change wrought in the Company's circumstances by the freeing of the lamp trade. At last year's meeting, the Chairman declared that thenceforward it would be necessary to exercise a good deal of reticence with regard to the Company's affairs; and this year again it has been stated that competition in the incandescent electric lamp business is so severe, that the Company's officials have to be most careful how they say anything that could arm their trade opponents with a means of attack upon the position of the Company. The profits in the past

year's working have been more than enough to declare a 5 per cent. dividend; but only 5 per cent. is to be paid—the remainder going to make a cash reserve. The Chairman, in effect, told the proprietors that theirs is to be carried on as a 5 per cent. concern for the future—and not a bad prospect either, if it can only be realized; while there can be no question as to the wisdom of the policy indicated.

Upon the subject of competition, the Chairman stated that, as might have been supposed, this is growing keener than ever. The Ediswan lamp has a certain reputation; and upon this it lives. But still a great many lamp users are naturally tempted by the offer of other cheaper lamps; one make of such goods being much like another, so far as outward appearance goes. But, says the Chairman of the Company, "lamps, like friends, can only be tested by experience; and those who try these cheaper lamps soon give them up, and come back to ours." Still, the competition is always a pressing one; and a temporary mishap at the Edison and Swan factory, resulting in the sending out of a parcel or two of inferior lamps, would be very disastrous to the Company at the present juncture. Other things have affected the concern adversely. "We had a strike also in the early part of the year, which disarranged our affairs. There were the usual consequences of a strike. Those who made it were a long time out of work, and lost a lot of money; but the strike opened our eyes to the necessity of finding some method of making ourselves independent of the class of people who caused it." It is the old story, of the old mischief dogging the development of the newest of industries, only to be dealt with in the oldest of fashions—the exercise of superior force.

It is rather to be regretted that Mr. Forbes did not say something about the other form of competition that has crept into the incandescent electric lamp trade—the competition of the new high-voltage lamps with those of the ordinary calibre. A curious statement, by the way, has appeared in an American technical periodical, to account for the conventional rating of incandescent electric lamps at 110 volts. It is asserted that this rating originated with Edison, who started the manufacture of lamps working at 100 volts; and, in order to make quite sure, he allowed a margin of 10 per cent. over the resistance provided for. In time, it was considered unnecessary to keep to this margin; and consequently Edison lamps were marked up to the full voltage of 110. There is, of course, no special reason why an incandescent lamp should be made for any particular voltage, besides the necessity of agreeing with the conditions of the supply with which it is to be used. The early incandescent lamps were made for 50 volts.; but at this pressure profitable central station lighting was hardly to be found anywhere. Doubling the voltage really created the central station, in the commercial sense; and doubling it again would be a great favour to certain stations that otherwise must sooner or later stand confessed failures. Only, there is the lamp to be fitted to the high-voltage service; and this does not appear to have been certainly accomplished as yet.

One would like to know what the Edison and Swan people think of the proposed new departure. Up to the present, all that has been heard from them is in the form of Major Flood-Page's "Times" letter, in which this accomplished apologist for leaving things as they are blandly asserts that it would be highly inexpedient in the public interest to depart from the standard voltage worked so successfully by the Edison and Swan Company. It may also be remarked that there was no hint in Mr. Forbes's speech of the advent or development of any serious improvement of the incandescent electric lamp. The Company can, as he proved, earn a 5 per cent. dividend by the manufacture and sale of incandescent electric lamps and fittings; and he held out the confident hope that this experience will be repeated in the future, for as many years as a business man and prudent investor need look forward. Perhaps it is because all the world does not share this belief that the Company's stock does not stand at par value. However this may be, no admission of the risk of the familiar incandescent lamp being superseded by the works of Tesla and Moore, or anybody else, was permitted to cast a shadow on Mr. Forbes's glowing statement of past successes and hopes for the future.

OBITUARY.

Mr. R. Ashby, a Director of the Staines and Egham Gas Company, died last Thursday, in his 48th year.

The death is announced of Mr. G. Bowdler Clarke, the Engineer and Secretary of the Woburn Gas Company.

At the advanced age of 85, Sir William Grove, the eminent lawyer and man of science, died at his residence in Harley Street, W., on the 1st inst. He was called to the Bar in 1835. About this time he was deeply engaged in electrical researches; and four years later, he devised the battery which bears his name. He was connected with most of the learned institutions; and on the occasion of the jubilee of the Chemical Society in 1891, he stated that he was one of the original members. He was elected a Fellow of the Royal Society in 1840, and as a member of the Council took an active part in reforming its constitution. He was President of the British Association at their meeting in 1866, and was also one of the Royal Commissioners on Patent Laws.

THE QUESTION OF MUNICIPALIZATION AT THE NEW HAVEN LIGHTING CONVENTION.

We have on several occasions referred to the holding, at New Haven, Connecticut, of a gathering called the Street Lighting Convention, the object of which is sufficiently explained by this remarkable title. So peculiar and novel a meeting deserves more than passing notice by all who are in any way interested in the subject. The fact of a large number of public men, city engineers, gas managers, and others, voluntarily assembling in this New England town for the purpose of considering the various bearings of the street lighting service, is highly significant of the importance in which this development of civilization is held in the estimation of a people claiming to be above all things practical and businesslike. It also indicates pretty clearly the absence of other facilities for ventilating the subject. It is probably correct to say that it would be difficult, to the point of impossibility, to get together in England delegates with satisfactory credentials for a two days' congress upon such a matter; but the circumstances of the two countries differ very notably in this regard. Whatever may be thought of the commercial system of the United States, it is generally conceded that the condition of the local government of the cities and towns is not, on the whole, creditable to the nation; and the state of most of the public services, whether performed by municipalities or companies, is also acknowledged to leave much to be desired. Many of the best citizens of the States admit these conclusions, which are frequently stated in the plainest terms in the more reputable organs of public opinion. Hitherto, however, there has not been any considerable effort on the part of the natural leaders of local society in the States to remedy the evils of this kind which confessedly exist. It has been cynically remarked of the foremost men of affairs in the largest American cities, that it has paid them better to attend to their own business, and contribute blackmail to the maladministrators of their municipal concerns, than it would to see to such things for themselves. There must come a change over American feeling and practice in this regard if the municipal institutions of the country are to continue to exist. Such a change must have a beginning somewhere, and with respect to something; and one would fain regard the Street Lighting Convention of New Haven as one of the first steps towards the attainment of a healthier condition of an important department of municipal activity.

The Convention appears to have been the outcome of a desire on the part of the Street Lighting Committee of the New Haven Common Council to make themselves better acquainted with whatever there was to be learnt concerning the most approved methods of performing the service confided to their charge. The initiative in calling it was taken by the Mayor of the City, in concert with the Chairman of the Committee, the President of the Board of Aldermen, and the Superintendent of Street Lighting. The invitation was responded to by a large, and, as to calling, diversified collection of interested delegates, representing all the various interests in this regard. Alderman Dr. Lambert, of New Haven, the Chairman of the Lamp Committee, presided over the meeting, the proceedings of which, as mentioned in our first notice of the matter, are reported in "Progressive Age" at extreme length; and papers were read which, for quality and appropriateness, take exceedingly high rank among the gas literature of America. A permanent organization, to meet annually, was the outcome of the occasion—such a result being the best possible proof of the interest of the gathering; and if the standard of the future conventions is maintained at the level set by the contributories to the transactions of the first, this will be about the best technical, or semi-technical, association in connection with the artificial lighting industries of the States.

Some of the papers, beginning with that read by Mr. Walton Clark, the well-known General Superintendent of the United Gas Improvement Company, of Philadelphia, are suitable for reproduction in our columns; but others can only be properly treated by condensation and paraphrase. We will begin by so considering a curious production for which a Mr. T. B. Persse—apparently a delegate from the Hartford Municipality—was responsible. This was entitled "The Municipal Ownership of Gas and Electric Light Plants," and was a florid statement, in the American manner and language, on the affirmative side of the question of municipal ownership of such undertakings. It may as well be remarked here that the contrary position was taken later by Dr. Allen R. Foote, who has some reputation as an "Individualist" writer on economic subjects. We shall deal with him immediately after Mr. Persse. It is to be regretted that circumstances prevented the full and fair discussion of the subject by the Convention, which could not have failed to be both interesting and instructive.

Mr. Persse began with the astounding assertion that "on the soil of Connecticut, and in the city of Hartford, this great principle of home rule and local self-government was born and cradled." We were under the impression that the principle was of a somewhat different origin and considerably wider development; but this is a detail. Descending to particulars, Mr. Persse observed that among his reasons for advocating the municipal ownership of gas undertakings was his own experience

s Chairman of a Corporation Committee appointed last year to investigate complaints against the local gas supply, when it was found that "neither the consumers nor the City Government could, under the law, enforce better service, or even any service whatever, from the Hartford City Gaslight Company." Hence, Mr. Persse jumped to the conclusion that the sole remedy for such an appalling state of things was the municipalization of the service. His conclusion was set forth with an exuberance of rhetorical fustian which our readers may well be spared, as it does not touch the question raised by the speaker. Perhaps if Mr. Persse had looked abroad for instruction, and possessed more of the wisdom that derives help from the observance of other people's experiences, he would have perceived that the question is not to be answered so baldly and summarily as he thinks. If the Hartford Gas Company are not subject to proper laws framed in the public interest, this is a pity; but it is hardly the fault of the Company. It is to be gathered from the paper, however, that the Company exist and carry on their business under the terms of a charter dating from so long ago as 1848, and renewed in 1883, which does in point of fact regulate the Company, while it incidentally protects them from reckless expropriation and piracy. It appears to be the latter consideration that arouses the wrath of Mr. Persse.

Supposing, however, that gas supply is not subjected to proper and effective specific laws and regulations, which is likely to be the better system of administering it, on general principles—by a company, or by a local authority? This is the question, reduced to its elements, which Mr. Persse ventures to answer in favour of the latter alternative, without, as it will appear to most people, taking sufficient account of the motives that would actuate the administrators of the respective systems. Which is more likely to create an efficient gas supply, or any other business—the compulsion of having to please the customer, or a sense of public virtue? In practice, of course, neither motive is relied upon to the exclusion of measures for the protection of the public interest; but it is pretty safe to declare that self-interest is more likely to keep business operations on a healthy basis than any other sanction that can be suggested. Candidly, we do not know of any method of regulating gas undertakings that can be relied upon to prevent bad management or vicious administration. In all affairs of life, there are men who are fools to their own despite; and for such there is no cure.

Mr. Persse has a distorted view of gas supply by municipalities as practised in England; but he forgets that the salient fact of gas supply in this country is statutory control. He complains that the State Legislature of Connecticut, sitting "a hundred miles away," refuses to a chance majority of the Common Council of his own town of Hartford the power to do what it likes to the local Gas Company; but so long as he ignores what the British Parliament does for both gas companies and gas-supplying municipalities, he is likely to remain in the dark as regards many things it would benefit the Street Lighting Convention to know.

The permanent officers of the Convention would be well advised to get some trustworthy person to study the whole system of American gas supply, with particular reference to the points of competition, guarantee of non-intervention, profits, and prices, as illuminated by contemporary practice elsewhere. Unfortunately, there is no sound local body of gas engineering opinion to which appeal could be made in this regard. The very men who would fight to their last dollar to preserve a "monopoly" in one town to-day, would be eager to poach upon somebody else's preserves to-morrow. Nobody thinks of the interest of the public in the matter; and so the unfortunate gas consumer "gets left."

Meanwhile, it is at least certain that neither in the United States nor in any other country has the gas consumer anything to hope from municipalization. American observers may be reminded that the cheapest gas in England, and consequently in the world, is dispensed by companies. The present generation of ratepayers in towns where the gas supply is municipalized may gain a doubtful benefit from the appropriation of gas profits to the relief of the rates, but only because such of them as are gas consumers consent to be doubly taxed.

In the long run, it is doubtful if anybody will be the gainer by the municipalization of gas supply, even in England and Scotland, where the standard of municipal honour and ability are happily high. It is as much the perception of this as anything else which keeps the British Government itself from attempting to nationalize the railway service of the country, to name a line of enterprise differing from the gas supply, but actually subject to Government control in many countries. Railway administration, however, in the American manner, is no more creditable to the nation than its way of dealing with gas supply, seeing the extent of the mileage that is in receivers' hands.

These are all matters that call for the immediate attention of the best Americans. If there is anything that we or our readers and correspondents can do to help the officers of the new American organization for the study of questions of lighting to a better comprehension of the results of the most successful contemporary practice in this regard, such assistance will be ungrudgingly given. British gas engineers do not claim to be able to teach their American brethren anything in connection with the *technique* of their common calling. Indeed, in one important branch we have been glad of late years to follow on the lines indicated by American experience. There are reasons, however, the nature of which is not comprehended across the Atlantic, why gas can be supplied in a number of scattered and differently situated English towns for something like the equivalent of half-a-dollar, or less, per 1000 cubic feet, and pay a reasonably good dividend at that. If our American friends really wish to know how this is done, with the honest desire of trying to do likewise, their laudable curiosity can be gratified without difficulty.

NOTES.

A Large Chamberland Filter.

Although it is becoming universally recognized that sand filtration of water for dietetic purposes is a biological operation, and therefore more "scientific" than it was formerly held to be, there are circumstances which forbid the use of this method of filtration in all instances. To meet an exceptional case of this kind, what is commonly known as a "Pasteur" filter—although the appliance was really invented by M. Chamberland—on a large scale has recently been completed by Messrs. Defries and Sons to the order of the municipal authorities of Darjeeling, with the sanction of the Government of India. The element of the Chamberland filter is a cylinder of unglazed porcelain, through which a continuous current of water can be forced, when it is deprived of all suspended impurities, including microbes, by the mechanical fact of the extreme fineness of the interstices of the material. The Darjeeling filter consists of a series of iron cells, each containing 250 Chamberland tubes, having the appearance of a hollow candle, and standing upright in the bottom of the cell. The water is admitted into these cells, and finds its way from without into the interior of the porcelain cylinders, whence it is collected in a state of almost absolute purity from disease-provoking germs. The filter elements are easily cleaned by scraping the outside of the cylinders, and washing them in dilute hydrochloric acid. The special interest of the Darjeeling apparatus lies in the large capacity of the plant, which comprises 38 iron cells and 9500 porcelain tubes, and is rated to deliver 150,000 gallons of purified water per day. A feature of the arrangement is the ease with which it can be kept in order by a single man without special knowledge. This consideration, coupled with that of its efficiency in dealing with previously contaminated water, and the readiness with which it can be set up where required, has led to the extensive use of the system in the French army.

Curiosities of Incandescent Gas Lighting.

Now that incandescent gas lighting has become so general, frequent references to novel peculiarities displayed by burners on this principle are appearing in scientific and technical journals, which have not hitherto found anything interesting in illuminating gas-flames. Thus in a recent issue of "Nature" there appeared two letters from correspondents describing phenomena of incandescent lighting which the writers deemed worthy of notice. The first described a case of optical illusion, observed while doing photographic work, in which the rays of an incandescent gas-burner, allowed to shine through a window into a dark-room upon the top of a red-light lantern, made this top appear as though it were loose, or displaced in opposite directions to those of the lamp when moved by hand. The writer explained this effect by referring to the different physiological action of the red and white lights seen at the same time. The second letter described the condition of an incandescent burner used for lighting a certain kitchen, which has a defective mantle, and consequently yields a poor light. It is stated, however, that "when the water-tap over the kitchen sink is running, the light greatly increases in brilliancy, maintaining that brilliancy as long as the water is running." This letter is headed "A Curious Connection;" and curious it certainly is—not to say unaccountable.

Moissan on Carbides.

M. Moissan, as our readers are aware, has been carrying on a systematic course of experiments by the aid of the electric furnace, with the object of discovering whether at very high temperatures carbon will combine with metals. Definite and crystalline combinations of carbon with metalloids and metals are as yet little known. The most important example is cast iron, where the carbon is dissolved in the metal. The point to be determined is whether any other such varieties of "cast" metals, containing carbon, exist within the range of modern pyrological resources. M. Moissan is able to state as a certainty that at the high temperature of the electric furnace some metals, including gold, bismuth, lead, and tin, do not dissolve carbon at all. Liquid copper only takes up a small quantity, which is, however, enough to profoundly modify its malleability and other properties. Silver and aluminium dissolve at their boiling-point a small quantity of carbon, which they give up in the form of graphite on cooling. The metals of the platinum group at their boiling temperatures dissolve carbon with facility, abandoning it in the form of graphite before they solidify. In 1836, Davy prepared a compound of potassium and carbon, which decomposed on the addition of water, evolving acetylene. Hence M. Moissan ascribes the discovery of acetylene to Davy. Lithia, or carbonate of lithia, acts in the same way with carbon. All these carbides decompose on contact with water, and disengage acetylene; but there is a second class which do not

decompose. In reviewing his researches, M. Moissan observes that the most curious reaction brought to light by them is the easy production of hydrocarbons—gaseous, liquid, or solid—by the action of cold water on certain of these metallic carbides. The existence of the carbides which are destructible by water may, M. Moissan suggests, modify the theories that have been advanced to account for the formation of certain petroleums and other geologic deposits.

Coal Dust Explosions.

From a study made by Mr. Donald M. D. Stuart of a remarkable colliery explosion which occurred on Feb. 6, 1895, at the Timsbury Collieries, in the Radstock district of Somerset, some facts and conclusions appear that may be read with interest as bearing upon the question of the instantaneous carbonization of coal dust. In this disaster, which was clearly attributable to coal dust (the mine being free from gas), there were eighteen distinct explosion *foci*, scattered over a total distance of 2614 yards of tunnels; the first of them being 191 yards away from the scene of the gunpowder shot which originated the series. The problem is to account for the concentration of explosive energy at these few places, as well as to explain what went on in the intervening spaces. To begin with, there was ¾ lb. of gunpowder fired; and this mostly blew out downwards upon the floor. Mr. Stuart argues that the surplus heat of this discharge was enough to distil hydrocarbon gases from the coal dust lying thickly on the ground, and to ignite the distillation products. There was not enough oxygen present to permit of the complete combustion of these gases, which therefore dissociated—the hydrogen burning to water, and the carbon depositing as damp soot. As a matter of fact, the pit showed all along the walls and on the timbers a finely-divided carbon deposit which was strongly adherent; and the roof of the galleries, ordinarily quite dry, was observed after the accident to be covered with water drops. The burning hydrogen supplied plenty of heat to propagate the action of distillation, and thus more coal gas was generated, which ignited, and ran with a smoky flame through the passages of the mine—only actually exploding when it met with a sufficient addition of oxygen to complete the combustion. In general, the explosions were most violent where there was most oxygen; and so the effect was propagated. Mr. Stuart finds confirmation for his theory in the character of the gases traced in the mine after the accident, which showed a large proportion of carbonic oxide. Mr. Stuart has elaborated his theory in a book entitled, "The Origin and Rationale of Colliery Explosions."

The Form of London Water Companies' Accounts.—As the result of communications addressed to them by the London County Council, the Local Government Board have made an order requiring the Water Companies to furnish in their accounts particulars with regard to the amounts written off in respect of empty houses, reductions in water-rents, and bad debts. The Council wished that the Companies should also state the amounts received in respect of water-rates, meter supply, and extras respectively. But the Board have not seen their way to accede to this request.

The Fire at Messrs. W. Sugg and Co.'s.—The cause of the fire on the premises of Messrs. W. Sugg and Co., Limited, mentioned in last Tuesday's "Journal," has not been discovered. The tinplate workers' shop which was destroyed showed nothing unusual at nine o'clock on the evening of the 31st ult.; and the fire broke out at three o'clock the next morning. Prompt measures were taken to repair the damage done; and most of the men were at work again in the course of last week, so that orders could be executed. It is expected that by to-morrow all will be employed.

Institution of Junior Engineers.—The summer meeting of this Institution (of which Mr. Archibald Denny is the President and Mr. Walter T. Dunn the Secretary) is to be held in Scotland from the 15th to the 22nd inst. A varied and attractive programme has been prepared; among the items being visits to the gas and electric light works in Edinburgh and Glasgow, and one of the reservoirs of the Glasgow Corporation. The members will have an excursion to Dumbarton, where they will be entertained to luncheon at the Leven shipyard by Messrs. Denny, and afterwards inspect their works. At the dinner, on the 21st., Lord Kelvin will be the guest of the evening.

Testimonial to Mr. W. W. Hulse.—In connection with the resignation of Mr. W. W. Hulse of his position at the Longton Corporation Gas-Works, the Gas Committee have passed a resolution, thanking him "for his services during the last ten years, and for his gentlemanly conduct and courteous manner to the members of the Committee on all occasions." The officials and workmen have testified their esteem for him by presenting him with a testimonial, in the shape of an illuminated address, recording their high appreciation of the many excellent qualities displayed during his long period of management of the works, and their regret at the severance of his connection with them. The testimonial was presented by Mr. G. T. Platt, the collector, at a farewell dinner, at which the new Manager (Mr. W. S. M'Gregor) presided. Mr. Hulse, in acknowledging the presentation, said his decision to relinquish the reins of office had been for some time in contemplation; and he felt that in Mr. M'Gregor he had a worthy successor.

TECHNICAL RECORD.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Edinburgh.

We complete to-day our report of the proceedings at the above meeting by giving the two remaining papers, with the discussions thereon.

Mr. Forbes Waddell (Forfar) read a paper entitled—

FORFAR RETORT-HOUSE PLANT.

Last year a new bench was erected, consisting, as is shown in the drawing [see next page] of four ovens—two for settings of six and two for eight retorts, each on the regenerative principle. I, however, reduced one of the ovens, by building an inner arch, in view of setting in it, in the meantime, only four retorts. On strong cast-iron brackets, bolted to steel binders, are supported two hydraulic mains; one for the settings of six, and the other for the settings of eight. Four dips, as shown, are provided with blind flanges. From the mouthpieces, the gas is led through cast-iron ascension-bends, steel ascensions, and cast-iron bridge-pipes, all 8-inch bore; and thence through cast-iron dips, the internal diameter of which is 8 inches, to 7 inches above and 7 inches below the cover of the hydraulic mains. The latter are entirely of steel plates; the covers and ends being ⅜ inch, and the sides and bottom ¼ inch thick. That serving the settings of eight and four retorts is 22 ft. 6 in. long and 22 in. wide.

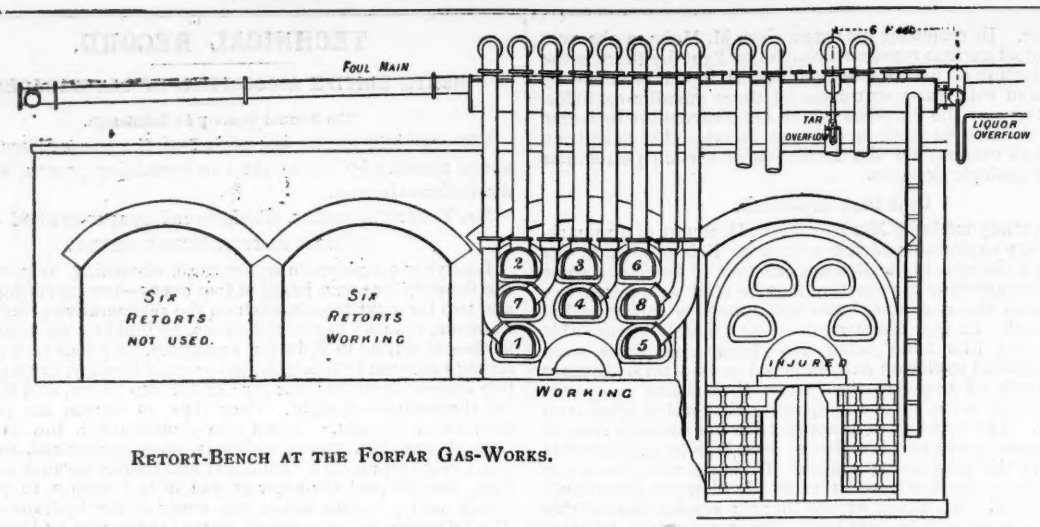
The tar and liquor are drained off by separate pipes. That for the tar is a U-shaped wrought-iron steam-pipe, 2 inches in diameter, provided at one end with a cast-iron flange 8 inches in diameter, and from 1 inch thick at the centre to ¾ inch at the outside. That end is fixed to the bottom of the hydraulic by six ⅝-inch bolts; and the other is set to overflow at a level of ¾ inch above the dip mouths, and is sealed at the outlet by a second U-pipe. Gas pressure is communicated from the main to the overflow point by means of a ¾-inch steam-tube. The U-pipe is 20 inches deep, and fixed 5 feet from the end of the main. The liquor is drained off by means of a 1-inch steam-tube, screwed into the foul main at a distance of 6 feet from the tar-pipe. Its upper end terminates at a level of 2 inches above the dip-mouths. It is sealed in the manner shown, and led to a point where it is conveniently seen when liquor is flowing from it.

As the dimensions of the ascension, bridge, and dip pipes and the principle of overflow are perhaps not the most usual, I now ask your indulgence while I, as briefly as possible, give you my bases of design.

Ascension-Pipes.—On a former occasion, I had substituted an 8-inch for a 6 to 5 inch ascension-pipe, and observed the following: (1) With usual heat, no liquid tar in 5-inch ascension-pipe. (2) With usual heat, quantity of tar in 8-inch ascension-pipe. The presence of this liquid tar in the 8-inch and absence of same in the 5-inch pipe depended, I argued, on the different rates of travel of the gas through the wide and narrow pipes; and in answer to my own question, "What becomes of liquid tar in the 5-inch pipe?" I thought it reasonable to say, "It goes to the hydraulic main." (3) With extra heat at the front of the bench, and therefore on the lower part of the ascension-pipe, a quantity of what I am inclined to call tarricles—conical pieces of tar coke—was deposited in the lower end of the pipe and on the mouthpiece. Under these conditions, the make of gas per mouthpiece and per ton was largely increased; and it is only a fair deduction to make, I opine, that the tar which was deposited on the mouthpiece as a liquid with usual heat was converted by means of extra heat into gas and tar coke. Of the latter I obtained, under the most favourable conditions, as much as 7 lbs. from one charge. The quantity of gas resulting from this secondary carbonization is surely considerable; but the extent to which we may benefit by it is not, I am sure, anything like represented by the figure I have just given. I am satisfied that experiment in the direction of returning to the mouthpiece as much tar as possible, and, by means of heat at present wasted, carbonizing it in the vicinity of the mouthpiece will be well worth pursuing.

Much of the above may be considered somewhat of a digression. But it furnished me with a reason for ascension-pipes being made large; and as I consider the following bear pre-eminently on my subject, I risk what you may call further trespass. From the water-washed like appearance of the bridge-pipes taken down from the setting of four retorts where the accident of Nov. 11 last occurred are from the presence at mouthpiece of tarricles, and from the fact that though making at times over 11,000 feet of gas per mouthpiece we have not had a choked pipe since the erection of the bench—from these facts, I say, it is reasonable to conclude that: (1) A liquor vapour is suspended in the bridge and its vicinity; (2) the tarricles at bottom would, under other conditions, go to the hydraulic main as pitchy tar; and (3) the liquor vapour is the means of keeping the hydraulic main free from pitching or pasting tars, and is therefore very desirable. It is, as far as I have been able to observe, due, on the one hand, to the gas temperature being lowered further by slower travel before it enters the hydraulic main, and, on the other, to a seal of liquor alone.

Overflows.—When designing the bench-mountings, I wished to get the best possible means of draining off liquids, and did

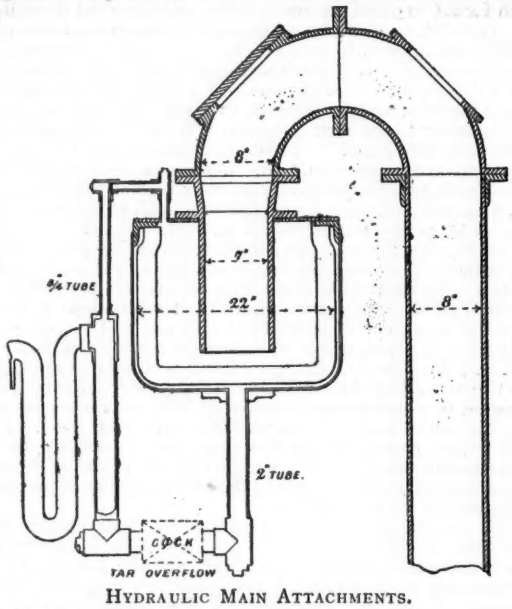


RETORT-BENCH AT THE FORFAR GAS-WORKS.

not specify, but asked each firm to furnish designs. These, however, disappointed me, as they were, without exception, that form which drains off both tar and liquor through one pipe fixed to the bottom of the main, and which I believe to be the most common form. The single overflow consists of a U-shaped tube of the same form, and fixed in the same way, as the pipe serving as our tar overflow, which is drawn here; and no doubt it has the virtue of being able to maintain a solely liquor seal. I had, however, previously adopted a modification of it which has given entire satisfaction to me, as it has to many. It is simply the addition of a second pipe, as described and drawn; and as it does not seem to be universally considered as safe as the single overflow method, I shall, in as practical a way as I can, endeavour to compare the merits and drawbacks of the two kinds.

I take it for granted that, for all practical purposes, the liquid products deposited in the hydraulic main are tar and liquor; and, further, that the characteristics of their behaviour are: (1) they do not mix; and (2) tar is heavier than liquor, and sinks below it.

With the aid of this vessel [shown], which correctly represents the dimensions of the means of overflow adopted at Forfar, I hope to explain clearly how both methods do their work. Suppose this



HYDRAULIC MAIN ATTACHMENTS.

vessel to be a hydraulic main, in which tar and liquor are being deposited; and, further, let this U-shaped tube fixed to the bottom be, in the first place, the only means of outlet for the liquids mentioned. On the liquids being poured in, you first observe that there is quite a distinct dividing line between them; they do not mix. Secondly, though no difference of surface level is at first observed, it becomes evident, as the levels are raised by adding more liquid, that the liquor surface mounts higher and higher above that of the tar. Just now, for instance, it is seen that the distance from the dividing-line or common surface is fully 11½ inches to the liquor-level, while it is only 10 inches to that of the tar—a difference between the surface levels of quite 1½ inches, and when the tar surface reaches the level of the overflow point, the liquor-level is, as you see, fully 3 inches higher. This overflow point is ¾ inch above the dip-mouths; and therefore the depth of seal is now 3¾ inches.

Single Method.—Up till now, you observe that nothing but tar has been drained off; the liquor following natural laws in floating on the top of the tar. I do not consider it advisable at present to go into the specific gravities of the two liquids from a nice point of view; but think our purpose is well served by observing that a column of tar 20 inches high is able to maintain one of liquor fully 3 inches above its own level, and that the difference of levels is proportionate to their height above common surface.

Now note that, as long as gas is being made, both liquids are being added to the contents of the main; and further note what happens with the single U-pipe method. The liquor-level has a tendency to rise further; but you observe the tar is no longer equal to supporting it, and the result is the flushing-out of all tar, and the lowering of the liquor surface inside to the same level as the overflow. The point I wish to make clear is this: With the single U-pipe overflow for both tar and liquor, the depth of seal varies from, say ¾ inch to 3¾ inches.

Two Separate Overflows.—Suppose, now, a start is again made with the same U-pipe; the liquids being added as before. It is observed that the behaviour is exactly what it was in the first case—that is, the difference of surface level is gradually increasing. The tar is again being drained off and the liquor left. Now try the effect of a second overflow-pipe, as adopted by me. I trust it is sufficient for you to observe that, no matter how much of both liquids is added, they are now both being drained off constantly. The reason why the tar is not now flushed out is, I think, obvious—viz., the liquor is not allowed to get too heavy for the tar. What I trust that makes clear is that this second overflow-pipe is the means of preventing the flushing and varying depth attendant on the single method.

A Contingency.—Let us now imagine that, through accident, the overflow point is lowered ¾ inch. What happens? You observed the seal with the single U-pipe to vary in depth from 3¾ inches to ¾ inch. Surely our only deduction is that, after accident, the depth will vary from 3 inches to 0 inch—that is, the dips are unsealed. Apply the same to the separate overflow method. The difference of surface levels being (as it is in our actual working) 1¼ inch, you observe, before the overflow-point is lowered, that the depth of liquor in the inside arm of the U-pipe is fully 9 inches. Now lower the tar-overflow ¾ inch, and observe what happens. If the liquor-pipe has not been lowered, then the difference of levels, which was at first 1¼ inch becomes 2 inches; but though the dividing line in the U-pipe is lowered about 6 inches, no liquor is yet flowing from the tar-pipe, and the seal is still full depth. Lower the tar-overflow still further, and the seal is still as deep. Finally, the difference of levels would require to go beyond 3 inches before any liquor finds a way out. This means that there is a margin allowing the tar-pipe to fall 1¾ inch at Forfar, and maintaining the seal. It is the fact of this second pipe preventing the liquor rising so high as to press out the tar, to which we are indebted for the safe seal under such circumstances; and I cannot but think it worthy of being called a safety-valve on that account.

Depth of Seal.—Anticipating a question as to the depth of seal and its pressure in the retorts, I may say we have, since we commenced to work the new bench, had the former 2 inches; and the 2 inches pressure consequent thereon has been reduced to 1 inch by maintaining a vacuum of 1 inch. Someone may say I could work, while the exhauster is in action, with a ¾-inch seal; and when it stops, the seal could be instantaneously increased by raising the liquor-overflow 2 inches and rushing in water. I presume you will admit that, with a 2-inch seal and 1 inch of vacuum in a hydraulic main, where the area of the idle dips is only $\frac{1}{10}$th the area of the main outside dips, the stoppage of the exhauster practically means a seal of $1\frac{1}{10}$-inch, and a pressure corresponding. What does the other mean? The difference of level between the two

overflows suddenly increased by 2 inches. In our case, this would be equivalent to making the liquor overcome the tar, flushing out the main, and reducing, instead of increasing, the depth of seal.

It will be noticed from the drawings that I have no adjusting valve on either tar or liquor overflow; and I may say my reason for such an arrangement is got from previous experience. The following gives the gist of it: Suppose one of your men raised the lip of such a valve, say, 2 inches at the liquor-pipe. The inevitable result in my case would be the gradual increase in difference of levels, the unsealing of dips, &c.

Our men have all along been required to give attention to the condition of the seal; and what I consider the safest plan is to listen to the bubbling noise made by gas in passing through the seal. To those who have, perhaps, not paid particular attention to this point, it will be interesting to learn that the noise from a 2-inch liquor seal is not at all loud; and with one of 1 inch deep, it is not to be heard from our retort-house floor. If the men hear it, then I consider it safe. But where the separate overflow method is used, there is a feature, in this connection, that should commend it to all—that is, if liquor flows from its respective pipe it is evidence that the seal is full depth; and if it is pure liquor, then the tar must be flowing from its overflow. If it is doing so, it cannot be pitchy or pasty.

Evidence Taken at Investigation.—The evidence taken at the inquiry was to the following effect: Setting of four retorts had first been in action. The overflow described was attached to the hydraulic main over that setting, which was injured. Setting of six adjoining eight next in use; and that of four retorts, with its hydraulic main, standing idle. Setting of eight retorts next started. On and before the day the accident happened, setting of eight and adjoining six working; the other setting had not been in use. Bench had then been in work over three months. Gas making often stopped to make temporary connection. Overflows had worked perfectly about three months. On the 11th of November no gas was made from 9 a.m. till we had made permanent connection to the purifiers. Before 7 p.m., water added to the hydraulic to compensate evaporation. Liquor at this time flowed from the liquor-pipe, and tar from the tar-pipe. Gas making commenced before 7 p.m. Exhauster stopped at about 9.20 p.m. Back-pressure observed to be 5½ inches. All reported right at 10 p.m. Two retorts of setting of six drawn and charged by 10.10. One retort (No. 4) in setting of eight drawn and charged by 10.10 p.m. No heavy bubbling or gas coming back. Man on six wheeling out coke, and man on eight half finished drawing No. 5 retort, when noise is heard, and gas comes back. The Manager, Mann, and Grant entered the retort-house, when Stark is just finishing charge. All hear very loud gurgling, and see gas coming back rapidly. Not a minute between gurgling and explosion. The doors of four retorts, already partly open, were previously opened wide. Flame issuing from broken bridge-pipes gradually falls, as two pailfuls of water are added. Bubbling now audible. Gas making goes on as before 10 o'clock, with bubbling heard from floor-level, without addition to seal. No sign of gas coming back. The hydraulic main was tilted, as shown, after accident; consequently, the tar-overflow was also tilted.

Opinions of Assistant to Mr. Vernon Harcourt.—Overflows fixed in a temporary way. Seal goes off when that goes down. The exhauster stopping means liquor going up dips and reducing seal. Advisable to raise liquor-level on stoppage of exhauster.

Discussion.

The PRESIDENT (Mr. A. Yuill, of Alloa) remarked that, as this was a paper in the discussion of which a great number of the members ought to take part, he was sure they would be able to assist in arriving at a solution of the question.

Mr. J. M'CRAE (Dundee) said he had listened with some interest to Mr. Waddell's paper. At the same time, it had been particularly unsatisfactory—probably through no fault of the author, as accidents would occur in the best-regulated works. What seemed to him (Mr. M'Crae) to be far worse was that they could not account for them, and did not know how to avoid them in future. They were very glad to learn that Mr. Waddell had recovered from his disaster; but what they all wanted to know was how to avoid such an accident. To start at the beginning, he entirely objected to a 2-inch tube to remove the tar from any hydraulic main. In his opinion and experience—not in the retort-house, for they had no such tube there, but outside—in the dead of winter the tar was very dense, and would become almost a solid mass; and a 2-inch pipe was not capable of removing it. Supposing the tar was quite liquid—and they knew that there was more liquor produced in the hydraulic main than tar—if the weight of the liquor forced the tar, what took place? The liquor would level itself, and there would be a ¾-inch seal. He thought it was not safe to work with a ¾-inch seal. He had in Dundee more than 300 retorts. The largest ascension-pipe was 5 inches in diameter; and they rarely heard of a stoppage. If they needed an 8-inch pipe to remove the gas from one retort, what sized hydraulic main would they require supposing they had 250 retorts in one bench? Everything was in a gaseous state when it left the retort, and the products were gaseous in the ascension-pipe, and an 8-inch pipe was quite unnecessary. To come to the point at issue: What was the cause of the explosion? Mr. Waddell had not told them. He had not even indicated; nor had the professional gentleman from London. He did not know how much Mr. Vernon Harcourt knew about it; but it was quite evident that he did not "strike oil," as they said in America, in regard to solving the mystery. Was it not possible that there was some extraneous cause at work—that some person could do something unknown to the Manager (for his eyes could not be everywhere) to produce a result such as this? It appeared to him (Mr. M'Crae) that the seal, by some unaccountable means, was so far reduced that the gas ignited; that seal became a gasholder only to this extent, that air was combined with the gas, which formed an explosive mixture. He was hopeful that some gentleman who had had more experience than he had in works of the size of those at Forfar, would be able to explain the accident away. He was quite sure that Mr. Waddell was desirous of ascertaining the truth of the matter. It said very much for him—he (Mr. M'Crae) would not do it himself—that he should come and read a paper upon any defect he had discovered. It showed his courage, and that he was courting inquiry. It was a matter of very great interest to them all, because if they knew the cause of this accident, they would know how to prevent such an accident in their own works. They had heard, for a very long time, discussions as to the desirability or otherwise of keeping the gas and the tar or liquid products from the retorts as long in contact with each other as practicable. They had also heard, on the other hand, that it was desirable to separate them as rapidly as possible. Many years ago, this was discussed by men of great eminence; and he might tell them that in Dundee, where they never had anything of this kind—they did not, of course, know how soon they might have—they had no 2-inch tubes and no U-tubes; and they allowed the gas, tar, and liquor to go together as long as possible. They worked by a seal which could be regulated, which could be altered only by the foreman in charge, and which was locked; and they paid no attention to the bubbling. The indicator on the top of the valve told them how much the seal on the hydraulic main was. That seal was ascertained every day at ten o'clock, handed down to him, and recorded, if there were the slightest reason. It might be a little higher in very cold weather, when the tar was in a state of viscosity. He would strongly advise Mr. Waddell to reconsider the overflow. There should not be such a thing as a 2-inch tube to convey tar of any density, because it had not the capacity to remove it if it should become thickened. Mr. Waddell had referred to the excessive heat derived from regenerative furnaces. He (Mr. M'Crae) had something like 240 settings of them in Dundee; and with 5-inch ascension-pipes they had no such difficulties as Mr. Waddell found. It was very good to state all their experiences; and if they jumbled them all up together, what came out might perhaps be best. He thanked Mr. Waddell for the trouble he had taken in getting the paper together; and he trusted, with the President, that the discussion would be worthy of it.

Mr. A. NAPIER (Crieff) asked Mr. Waddell where the U-tube terminated.

Mr. WADDELL: It goes into the pipe leading to the tar-well.

Mr. NAPIER: Is it sealed beyond what we see?

Mr. WADDELL: No.

Mr. NAPIER remarked that it would act very much like a syphon. This would explain Mr. Waddell's requiring to fill in water for such a brief period as he did. He (Mr. Napier) had frequently had to lie off for longer. He should expect that the U-tube would be blown; and hence the seal would give way at the dip-pipe. They would then only need one or two pailfuls of water to make up what had been blown out. Another little matter came out in the course of the inquiry—that periodical pumping of the hydraulic main was required. This was something unusual. He did not think he had heard Mr. Waddell explain that.

Mr. WADDELL: No; it did not. It was a temporary overflow before that was erected. The main was put up in three days, and the overflow had not been finished; and the evidence states that it was a temporary pumping of the tar, because it could not then be strained off in this way.

Mr. NAPIER: When you have to lie off for six or nine hours, have you to add water?

Mr. WADDELL: Yes.

Mr. NAPIER: Then I should say that the syphon principle is at work in your U-tube, if you require to be continually adding to the water in the hydraulic main.

Mr. D. VASS (Portobello) said he did not quite follow Mr. Waddell, when he said he had a separate overflow, that it in any way altered the dip. He thought the overflow of the liquor would be a source of danger, especially with such a small pipe, because it caused the tar to flow almost in a dead state. He was working with a much larger pipe, and only with one tube, passing tar and liquor through the one. He did not think the back-pressure was reduced in the slightest by applying a double overflow.

Mr. A. WILSON (Dawsholm) thought Mr. Waddell deserved great credit for bringing the subject before the members. He had been at considerable pains to give them, as he said, the basis of the various arrangements he had at work. Those he had for taking off the tar and liquor were certainly very good, as anyone who had employed them could say. He had had experience with them for a great many years; and if ever he had the full charge of works again, he should certainly go back to them. The two overflows gave them practically a steady seal,

which they had not, and could not possibly have, with one outlet from the hydraulic main. The liquor overflow was the limit to which the contents of the hydraulic main could rise; and, being higher than the tar overflow outlet, as soon as the tar in the hydraulic main rose to a level to which was added the height of the liquor, they got rid of the tar; and under those circumstances it was always taken away as soon as it was made. In the case of the one overflow, they had a flushing arrangement periodically. The contents of the main came down to the full level of the tar overflow. As the gas making went on and the residuals were being produced, the tar rose in the hydraulic main again, and filled up the outlet leg of the overflow; so that they required a higher heat inside the hydraulic main to force out the leg that was full of tar. In this way the liquor in the main was continually varying. In the case of the double overflow, a constant level was maintained, which was a thing they ought to strive to get, as it kept a constant pressure on the retorts. The whole point of Mr. Waddell's paper was to try to arrive at the cause of the accident in the works at Forfar. As to the large ascension-pipe, he did not think Mr. Waddell was very far out. If he obtained 11,000 cubic feet of gas per mouthpiece with an 8-inch ascension-pipe, and thought he could only get 9000 or 10,000 cubic feet by using a 5 or 6 inch pipe, he (Mr. Wilson) should say he was entitled to use an 8-inch pipe. From the report of the inquiry, and the figures given there, it seemed that liquor was overflowing from the hydraulic main just before the accident. The putting in of a small quantity of water seemed to him to be a very ordinary precaution to take after a stoppage—just to make sure. It afforded ocular demonstration that the main was in its proper condition. Gas making was started again, and continued for some time; and then a bubbling noise was heard, showing that the gas was coming through the liquid products in the main. Suddenly an extra pressure came on the work somehow. As had been pointed out, this might be extra pressure, or it might be the lowering of the seal in the hydraulic main. He thought there had been some additional pressure; and his reason was that after the accident two pailfuls of water were added. What difference would two pailfuls of water make in a length of hydraulic main? It would be only about 1-16th of an inch. After a blow-back, he thought they were generally obliged to add a considerable quantity more than was actually needed to seal the main in the ordinary way; and he certainly thought that two pailfuls would never stop the bubbling if the seal were low. Besides this, after the two pailfuls of water were added, gas making went on quite as usual. So far as they understood, the same arrangements—the same tar overflow and the same liquor overflow—were in operation to this day; so that, if the accident happened in the one case, it would certainly do so again unless there had been some extra pressure in the works. It was perhaps going outside the paper, but he supposed they all had had their troubles, and Mr. Waddell had had some with his men; and the only thing he (Mr. Wilson) looked to as the cause of the accident was that some extra pressure had been brought to bear upon the hydraulic main. They knew how the mere shutting of a valve would put on pressure, and throw the tar and liquor on to the floor; and then suddenly the whole thing righted itself, without any harm being done, and gas making went on again. So that, from what he saw there, and from what he had read, he did not find anything wrong with the arrangements in the Forfar retort-house; and the solution of the problem seemed to him to be that there was some stoppage in the works. Apparently, if the syphons had been left unpumped, this would not have righted itself without assistance; and his opinion was that there must have been tampering with some of the valves in the works to have caused the stoppage in so short a time, and the trouble righting itself without anything being done.

Bailie Adamson (Forfar) asked the meeting to excuse him taking up a position he had no right to assume. He was one of Mr. Waddell's Commissioners. He was not one of his enemies, nor was he his particular friend; but if they would permit him to offer a remark upon the great point of extraneous influences in connection with the accident, he would say that, if the meeting could direct their mind to that extraneous influence, and try to come to a finding upon it in some way, as the gentleman who had just spoken had done, he was perfectly certain it would relieve his own mind and those of his brother Commissioners; and it would clear Mr. Waddell in respect of the management of the gas-works.

Mr. A. Bell (Dalkeith) said he was glad Mr. Waddell had one of his Commissioners present to hear what the meeting had to say. He regretted that Mr. Waddell had given them little or no information in regard to his own opinion as to the cause of the accident. He had given them a very elaborate description of his fittings in the hydraulic main. He himself certainly would not like to deal with a 2-inch pipe for taking off tar. Still, it had been only recently in use; and he hardly thought there had been much pitching up with tar. As Mr. Waddell's Commissioner had asked them if they could give him any opinions bearing upon the matter, he (Mr. Bell) would state what happened in the works with which he was connected. His predecessor was not in very good odour with some of the men. He happened to be out one night when one of the fellows who was in charge wished to see him; and he said: "I will find the means of fetching him." He thereupon went and shut down the outlet-valve, and threw the town into darkness. By the time the manager got back to the works, the thing was rectified, because the man had opened the valve again. It could be done easily; and it might have been done in this case. He should like very much to hear what Mr. Waddell's opinion was. The exhauster had been standing still; and, in re-starting it, he would have to alter his bye-pass. Was the bye-pass all right? The only difficulty he (Mr. Bell) had was that, if it were an outside stoppage, and the pressure was coming on, it would empty the hydraulic main. According to the evidence, two pailfuls of water put the matter right. He could not see how this was possible. If it were an outside pressure sufficient to empty the pipes, then fifty pailfuls of water would have been required.

Mr. J. M'Gilchrist (Dumbarton) thought that, after what Mr. Waddell had told them that day, there could be no two opinions on the subject. He believed a valve must have been shut down, and then opened again immediately after, before the explosion took place. Still he considered there were better methods of draining the tar and liquor from the hydraulic main than Mr. Waddell had shown them; but there was certainly nothing in that system to prevent its working very well. He felt, with Mr. Wilson, that only a valve shut down could have caused the explosion. With regard to the two pailfuls of water, there was an old saying that it was the last straw that broke the camel's back; and he could quite see how two pailfuls would be effectual, more especially as, the retorts being still at work, there would be some tar and liquor made.

Mr. R. S. Carlow (Arbroath) said his opinion was that there must have been outside obstructions—a shutting of a valve somewhere. Whenever the back-pressure came on, it would swell the water up to a considerable height; and if the valve were relieved, it would just go back again. So that it was possible two pailfuls of water would make up the quantity lost. With regard to the seal on the hydraulic main, he was perfectly satisfied that it was not through the want of seal that the accident happened. His view was that it was an obstruction in the inside of the gas-works, between the hydraulic main and the gasholder. He did not want to blame anybody; but he thought the circumstances warranted severe criticism. They should say exactly what they thought was the cause. He spoke from his own experience. When he was a boy, his father had charge of two or three small gas-works on gentlemen's estates; and he was sent out to take charge of them. He had to put on the valves before he left, if the gasholder was full. He remembered that on one occasion he forgot to open the valve at the large meter; and he had the same experience that Mr. Waddell had in Forfar—back-pressure. Gurgling began; but the moment he turned the valve, everything went right.

Mr. R. Mitchell (Edinburgh) said that for a considerable number of years the treatment of tar and its removal from the hydraulic main had occupied a good deal of his attention; and while he quite agreed, to a certain extent, with what Mr. Waddell had as his overflow, he thought the same advantage could be obtained by a much simpler method. If Mr. Waddell were to take the 2-inch tar-tube into the hydraulic main, and so many inches up, and put over it a hood with two or thee holes in it, so that the pressure of the gas in the hydraulic main would not make it act as a syphon, he would have a better method. He (Mr. Mitchell) had this in his own works on three sections of the hydraulic main; and he found it answered admirably. His dips worked in nothing but liquor. The tar came off as it was formed; and he had had no difficulty whatever with it. As to the cause of the explosion at Forfar, he read with very great interest the notices in the local papers, and also the finding of the expert who was sent down to make an inquiry; and he failed to see that the result of that inquiry was of any use whatever. To his mind, the facts pointed directly to some interference with the plant altogether outside of the retort-house. He was perfectly satisfied that, if the valves had been left untouched, the two pailfuls of water, as Mr. Waddell had stated, would have been of no use whatever; but it occurred to him, in going very carefully over the whole matter, that the gas had received a sudden check, which blew the seal, and filled up the next setting which was standing idle.

Mr. A. MacPherson (Kirkcaldy) said it was almost impossible to add anything to the very full discussion which had taken place; but, like Mr. M'Crae, he must say he was no believer in such appliances as those shown for removing the tar from the hydraulic main. Were he to fix such a thing, he should certainly have it of larger dimensions. He preferred to take the tar and liquor away together, and separate them afterwards. But there was no reason why Mr. Waddell's arrangement should not work satisfactorily. The only thing he said was that the 2-inch pipe was small, and the ¾-inch pipe too small. As an engineer, he had fixed double overflows, although against his will, in some instances; but instead of ¾ inch, he invariably made them 1½ inches, and gave instructions that they were to be examined at least once a week. They could easily see that any check upon this would immediately cause the tar to act as a syphon. But against that they had the fact that Mr. Waddell saw liquor flowing from the tube, which would show that it was at that level before the accident. As to the two pailfuls of water, he had seen pitchy tar formed into a sort of cup, and sufficient liquor remaining there to seal the dip; but the gas coming on might have thrown that out and thereby unsealed it. Against this, however, there was the theory of the

two pailfuls of water. These might have put the thing right; but they had again the fact of the observed flow of liquor, which they would see could not have taken place. But he thought the better and the safer way (and he was certainly conservative enough to stick to it) was the older plan of having a bridge across the hydraulic main—say, 6 inches from the main—dipping 4 inches down, and rising 2 inches, so as to force the whole of the tar to pass off first. This would give them a practically clear main, without any risk such as the other method entailed. At the same time, he thought it was perfectly evident that there must have been obstruction somewhere; and that this was sufficient to cause the rising of the back-pressure to such a degree as to throw the liquor out of the hydraulic main.

Mr. T. Douglas Hall (Montrose) said, as a neighbour of Mr. Waddell's, he should like to add one remark, and that was that he was quite at one with the majority of the speakers in thinking that there was an obstruction in the works, and that this obstruction was of very short duration, as they gathered from one or two points in connection with the accident. He had read the evidence very carefully; and being so close to the neighbourhood of the accident, he took a great deal of interest in it. He could quite easily see how two pailfuls of water could put things right, because, if the obstruction were of short duration, the small pipes which Mr. Waddell had for running off the liquor and the tar would have no time to reduce the level of the water in the main to such an extent as to require much water to restore it. The heavy back-pressure coming on the surface of the liquor would simply send the water up the 7-inch dip-pipe, and it would remain there for a few moments. Whenever the obstruction was removed, the water would fall back to its level; and seeing that it only required two pailfuls of water to restore the seal, he thought it was shown that it was just as Mr. M'Gilchrist had said—it was the last strain; and the facts that gas making had gone on for a considerable time after the works were re-started, and that Mr. Waddell took care to test the hydraulic main, and obtained liquor by adding a pailful or two of water, were to the same effect. There was only one little point on which he should like Mr. Waddell to satisfy the meeting. It was whether the stopping of the exhauster was ever pointed to as having had something to do with the pressure coming on suddenly. He should also like to know what sort of bye-pass Mr. Waddell had to the exhauster, to provide for a sudden stoppage; because the shutting of a valve must have been for a very short time, seeing that the matter was so easily put right. This was the most puzzling point in the whole affair.

The President said he intended to have spoken on the paper; but, from the opinions they had heard from the various speakers, he did not think there was any need for him to say anything. He thought they had proved that the cause of this accident must have come from the outside. The one remark he should like to make was that, to his mind, a valve was stopped from the outside; and what happened afterwards would have occurred in the event of this being done. He was not surprised it only required two pailfuls of water to fill the hydraulic main, because, if they took the level in it with a pressure of (say) 5 inches, they would have all the liquor forced up the dip-pipes, by which the level would be brought down so as to let the gas out; but when the pressure was removed, back would go the water, and perhaps the addition of two pailfuls of water would put the matter right.

Mr. Waddell, in reply, said he was very much obliged to the gentlemen who had discussed this matter at length. He did not think he could go over all Mr. M'Crae's remarks. The exhauster was stopped at 9.20 p.m. At that time, the pressure was registered at 5½ inches. This did not alter, so far as anybody knew, till 10.20, or thereabouts. Now, if the seal had been light—that was to say, if it had been actually a shallow seal of liquor, so shallow that back-pressure would do away with it—the gas would have come back surely at 9.20, or at the next drawing of the retorts. At least three or four retorts were drawn between 9.20 and the time of the accident taking place. He did not see how, in those circumstances, the stoppage of the exhauster could have made the pressure such as to unseal the dip. It had been working at 5½ inches all along. As to the bye-pass, it was now being altered; but, at that time, it was a four-way valve. They had fourteen retorts working. Now, if that valve had been turned wrong, or anything like wrong, at 9.20 p.m., would it have been possible for the gas being made in fourteen retorts to have confined itself to the exhauster, the condensers, and the hydraulic mains? He said it would not; it was altogether impossible. If this valve had been shut, he thought it would have given that extra high pressure at 9·20 instead of 10·20. One thing he would mention about a light seal. No 4 retort, which was attached to that end of the main, as they would see, over the furnace, and where the movement, if there were any disturbance, would be greater than over the other setting, would have a shallower seal. Now, it was charged before No 5 retort, and no gas came back when No 4 was charged. It came back suddenly when No 5 was charged, and it went away suddenly. He gave it as his opinion—and he did not hesitate to do so—that there was an accumulation of pressure; and he did not think anything would ever alter his mind on this subject. He did not believe the accident could have happened otherwise. As to who caused it, or whether it was a man or something else, he had his own opinion; and they knew, he supposed, that he did not require to be delicate upon it. He stated at the inquiry that it was an accumulation of pressure; and he did not think 5½ inches were anything like enough to do it. He did not see how anyone could get past the loud, bubbling noise. If they had a light seal or a seal was falling, or even supposing the seal were broken, they would not have a 2-feet flame or a loud gurgling noise.

The President asked the members to record their thanks to Mr. Waddell for his paper, and for the trouble he must have put himself to in preparing the apparatus before them.

The request was at once complied with.

Mr. J. Ballantyne (Rothesay) read the last paper on the *agenda*, entitled—

NOTES ON BACK-PRESSURE.

Back-pressure is a subject in which, as gas managers, we are all more or less interested. It is sometimes a difficult problem to solve, and gives no end of trouble and anxiety, and often loss. Choked-up pipes, blowing seals, and accumulations of carbon in the retorts are some of the results of back-pressure. It is a thing we cannot get rid of. It is ever present with us, do what we may. As long as it can be kept under control, we have not a great deal to fear from it. As gas-works are at present constructed, it is impossible to avoid having some back-pressure, though various methods have been adopted to minimize it as much as possible.

I do not intend to enter into a discussion as to what should be the maximum or minimum back-pressure in any works. This is a question which every manager must determine for himself, according to the nature of the plant he has to work. My object is more to show, by a few experiments, how back-pressure acts. For this purpose, I have had two small holders made—one to represent the exhauster or forcing power, and the other the storage holder. The former will be referred to as the exhauster, and the latter as the holder in all subsequent reference to them; and the number of inches shown on the scale of the exhauster will be referred to as 1 inch, 2 inches, and so on, of the contents of the vessel. I have also a vessel to act as the purifiers, so far as back-pressure is concerned. Two Woulff's bottles will represent the washer and hydraulic main.

Back-pressure is caused either by the weight of the holder or by some obstruction (in the form of a solid or liquid) to the passage of the gas; or by the pipes and apparatus being too small for the duty required of them. With small apparatus, the more gas forced through the greater will be the back-pressure; or, to put it another way, the greater the quantity we send through in a given time, the greater will be the pressure or force required. For example, we will connect a small glass nozzle to the outlet-pipe of our experimental exhauster. To pass 1½ inches of its capacity per minute will require 2 inches of pressure; and to pass 2 inches of its capacity in the same time, 3 inches of pressure will be necessary. We will next pass the gas through our lime vessel, supposing it to be too small for the duty required of it, with the lime packed so that ½ inch of the exhauster capacity can be passed through it per minute, when it will give 2 inches of back-pressure. If we pass double the quantity in the same time, it will give 4 inches of back-pressure; and if three times the quantity, 5 inches of back-pressure, and so on. This clearly shows that to pass more gas through any obstruction, a greater back-pressure will be the result.

When the pipes or apparatus are too small—especially in works without an exhauster, or if the defect is between the hydraulic and exhauster—there will be an increased pressure in the hydraulic main, and a greater deposit of carbon in the retorts, which means extra labour, annoyance, and worry to the manager and men, and a considerable loss to the corporation or company. And this loss is not all due to the richest part of the gas being deposited as carbon; there is also the labour and expense of removing the deposit, and greater wear and tear to the retorts in taking it out. Under such conditions, retorts will not last so long, nor give the same yield per ton of coal carbonized, because they are so often broken up during these carbon cleaning operations. In works with an exhauster, extra back-pressure necessitates the exhauster being driven at a greater speed to overcome the obstruction, which means waste of steam, and consequently of fuel, as well as greater wear and tear to the boiler and exhauster, all of which causes greater expense in working.

It is generally understood that passing gas through a solid substance—such as lime or oxide of iron in the purifiers—causes back-pressure; but there seem to be differences of opinion among gas managers as to how it acts. Some hold the view that the back-pressure at the exhauster-outlet is that of the purifiers *plus* that of the station meter and the holder; *i.e.*, if the purifiers give 3 inches of back-pressure, the station meter ½ inch, and the holder 4 inches, then the back-pressure at the exhauster-outlet will be 7½ inches. Others hold that this is not the case until the purifiers give a greater, or as great, back-pressure as the holder. That is, if the holder gives 4 inches, the back-pressure at the exhauster-outlet will be 4 inches until the purifiers give, (say) 5 inches, when the back pressure will be increased to 9½ inches—the holder pressure *plus* that of the station meter and purifiers. According to this theory, as long as the pressure from the purifiers is less than the holder, it will not show. Experiments made with this apparatus show that the first of these

views is right; but it does not always follow that we shall have a pressure at the exhauster-outlet composed of pressure from the purifiers, station meter, and holder. The second view is only partially correct, because I find that any pressure, no matter how small, which is given by the purifiers has to be added to that of the holder. It is only right in so far as the holder pressure will be found at the exhauster-outlet when the purifiers give no back-pressure.

With a question such as this, it is only by experimenting on a small scale that we can ascertain the facts of the case. In actual working, we cannot disconnect our purifiers from the station meter and holder, and blow the gas into the air to ascertain how the various pressures act. I will now pack the lime in the lime vessel, so that the passing of ½ inch of the exhauster contents per minute will show 2 inches of back-pressure. I then connect the holder giving 4 inches to the lime vessel, when you will notice that, by passing the same quantity of gas in the same time, the back-pressure will be increased to 6 inches at the exhauster-outlet. But to pass about half this quantity in the same time, we shall require only 2-10ths or 3-10ths more than 4 inches, or just sufficient to enable the exhauster to pass the gas into the holder. I will now disconnect the holder from the lime vessel; and in passing this smaller quantity, no back-pressure is indicated from the lime.

Let us now repeat the experiment with the lime packed still harder, so that the passing of the ½ inch per minute will indicate 3 inches of back-pressure. The holder will remain at the same pressure. We now get 7 inches indicated at the exhauster-outlet when ½ inch of its contents is passed per minute; and by reducing the quantity passing through the lime, it will again show little or no back-pressure.

With lime and oxide of iron, gas can pass through either way. It is not an absolute seal, as in the case of liquid, to the extent of its resistance to the passage of the gas; so that gas from the holder can pass as easily back through it as it can go forward. We must therefore consider that a certain quantity of gas can always pass either way through our purifiers, no matter how hard the purifying material may become—so long as it is not altogether impervious to the passage of gas, which is hardly possible. Therefore, while gas can get freely through the purifiers, there will be no back-pressure from them, but only that of the holder at the exhauster-outlet. It is when the purifying material becomes too hard, and therefore obstructs the passage of the gas through it, that it will cause the extra back-pressure.

At the Rothesay Gas-Works, we always have the pressure at the exhauster-outlet the same as that of the holder. On no occasion have I noticed any exception to this. The pressure varies with each holder and each lift of the holder; but it always corresponds with it. We pass the gas through 30 inches of Irish lime; and each ton purifies about 236,000 cubic feet. The action of the purifiers, therefore, in regard to back-pressure altogether depends on the state of the material used, or the quantity of gas passed through them in a given time. In works where the pressure is increased by the purifiers, the material is, no doubt, caking very hard, or the purifiers are too small; stopping the passage of the gas, and therefore acting in the same way as small pipes or other small apparatus. From the experiment made, I am also convinced that in works such as those in Rothesay, where the pressure at the exhauster is always that of the holder, no back-pressure whatever is given by the purifiers, probably owing as much to the nature of the material used as to the size of the boxes. It may require two or three times the quantity of gas to be passed through, before there will be any additional pressure from them.

Suppose we stop making gas, then the pressure at the exhauster will be the pressure of the holder, as shown on our experimental gauge, when the exhauster is turned off, and the gas allowed to get back through the lime, if no liquid seal intervenes to stop its passage from the holder to the exhauster. When we again start to make gas, that must be the pressure in the first instance against which we have to work. Any addition to this pressure, as we have seen, must be caused by the gas not getting away freely through the purifiers.

This is only applicable to works where the gas is not made to pass through liquids between the exhauster and purifiers. A scrubber filled with birch twigs or boards, and with the water-spray at the top, will give little or no back-pressure in actual working, because the material is too open to cause much friction or obstruction to the gas passing through it. I cannot say how coke acts in a scrubber in regard to back-pressure, never having had any experience with it; but I am inclined to think there may be some back-pressure from it—especially when it has been in use for a considerable time.

It is quite different when we have to deal with passing gas through liquids, as in our hydraulic mains and washers or washer-scrubbers. The liquid is a complete seal; and no gas can possibly get through until the pressure of the gas exceeds the weight of the seal. Therefore whatever back-pressure the washer gives, if it is placed ahead of the exhauster, as is generally the case, is added to the other back-pressure. For example, if the washer gives 2 inches of back-pressure, and the holder and purifiers 4 inches, then the back-pressure at the exhauster-outlet will be 6 inches. These pressures are always *plus* each other. To illustrate this, I will now introduce the Woulff's bottle to represent a washer placed ahead of the exhauster, and give the inlet-pipe 1½ inches of seal in the water. This will do just as well as a division-plate or plates, as you will notice by passing the gas through the two bottles. Each seal adds to the pressure. We now find that the back-pressure from the washer is about 2 inches, with the gas passing at the rate of ½ inch per minute. The lime box is next connected; and we find there is no extra back-pressure from it, if we pass a smaller quantity per minute. But in passing the same amount, the pressure is increased to 4 inches, or *plus* whatever pressure the lime vessel gives by itself. When the holder is connected, its pressure is also added to that of the washer and lime vessel, if we still pass our given quantity; but if the smaller amount, it is added to the washer-pressure only.

In all cases, therefore, where gas is made to pass through liquids of any kind, the back-pressure is increased. The liquid is quite different in its action from lime and oxide of iron in regard to back-pressure, because, as already pointed out, no gas can get through it until a force is used superior to the depth of the seal. Whatever back-pressure the other parts of the plant may give, is pressing down the liquid perpendicularly to its surface, and has to be overcome by the gas after it has been forced through the liquid seal. This action is well shown by the glass tube in the centre neck of our experimental bottle, where the liquid, you will observe, has been forced up the tube to the extent of the back-pressure. This brings out another point in connection with pipes sealed in liquid, as in the hydraulic main, and where a pipe sealed in liquid acts differently to the plates underneath which gas is often made to pass in washers. With a plate, any force slightly superior to the seal of the plate will cause the gas to find its way back beneath it as easily as it can go forward; but when a pipe is sealed by dipping in a liquid, its seal cannot be forced under ordinary circumstances.

Take, for instance, the dip-pipes in the hydraulic main. We will suppose the dip is (say) 30 inches from its lower end to the underside of the bend. Then, before its seal can be forced, it will require a pressure above 30 inches, unless there is too little liquid in the vessel to fill the pipes. To illustrate this, let the three-necked Woulff's bottle represent an hydraulic in which there are two dip-pipes. We will now allow the pressure from the holder to act on the surface of the liquid, when it will be seen that the liquid immediately rises in the dip-pipes to the extent of the back-pressure. If the back-pressure is 3 inches, the liquid rises 3 inches; and if 4 inches, the liquid will rise 4 inches, and so on as long as there is enough liquid to keep up the connection between what is in the vessel and what is in the pipes. With too little liquid or too little seal, the liquid in the pipes will become separated from the main body of the liquid; and the gas will pass through with a much smaller excess of back-pressure than 30 inches if the exhauster is not working. With the exhauster in use, this will not apply. But suppose there is no exhauster, or, if there is, that it is stopped for cleaning and repairs; then we should have our seal arranged in such a way that it can be immediately raised to the necessary level, and no more, to prevent the gas from coming back into the bridge and stand pipes.

The amount of seal required for this is a matter of simple calculation. Dip-pipes are generally 5 inches in diameter, which gives an area of 19·635 inches. This multiplied by the length of dip in inches from its lower end to the underside of the bend (inside) will give the number of cubic inches required to fill it. Multiply this again by the number of dip-pipes in the hydraulic, or section of it, and you have the total quantity of cubic inches required for all the dip-pipes. Then ascertain the area of the hydraulic inside at water-level, and the quantity of liquid displaced to fill the dip-pipes is easily ascertained. Suppose the hydraulic main is 20 feet long by 24 inches wide inside at water-level, and there are 12 dip-pipes in it, each 5 inches in diameter by 30 inches from the lower end to the underside of the bend, then—

$$\frac{19{\cdot}635 \times 30 \times 12}{240 \times 24} = 1{\cdot}227 \text{ inches.}$$

So that 1⅛-inch seal would be ample. If there are 16 dip-pipes, then the seal will require to be 1¾ inches, because more liquid will be displaced to fill them. Should the hydraulic vary in width between the water-levels, allowance must be made for this when calculating its width. More seal than this will be of no benefit whatever, but will rather be a drawback, by adding extra resistance to the gas passing from the retorts.

The PRESIDENT said he must apologize to Mr. Ballantyne for the way in which his paper had been hurried through; but it had not been owing to any discourtesy. If anyone wished for further information, he was sure the author would be pleased to give it: If there were no members prepared to take part in a discussion, he would propose that they should accord their thanks to Mr. Ballantyne for his trouble in preparing the paper, and more especially for bringing apparatus to illustrate it.

Mr. R. MITCHELL (Edinburgh) said he should like to ask one question, and that was whether, if they were to communicate with Mr. Ballantyne on the subject of the paper, he would answer them in time for publication in the Transactions of the Association.

The PRESIDENT said the question would be attended to.

The remainder of the general business was then disposed of, as reported in the "JOURNAL" for the 28th ult. (p. 166).

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

To-day we publish a further instalment of our report of the proceedings at the first annual meeting of the above Association, by giving an abstract of the paper read by Mr. C. E. De Rance. It was of great length, and was read in his absence by the Secretary (Mr. W. H. Brothers). It was entitled—

HYDRO-GEOLOGY AND HYGIENE: LAW AND LEGISLATURE.

The author commences by observing that the term hydro-geology, to express the study of the passage of water when, as rainfall, dew, or snow, it reaches the surface of the ground, or percolates beneath it, appears to him to deserve more general acceptance than has been accorded to it. He speaks of the magnificent work of Mr. G. J. Symons in connection with the rainfall of the country, and then states some facts as to the comparative area occupied by various classes of rocks and their varied degree of porosity. He says that if a geological map of England and Wales and a hydrographical map showing the rainfall be compared, it will be at once seen that the hardness of the Lower Palæozoic rocks has caused them to form the three highest areas—viz., Dartmoor, and the Welsh and Cumbrian mountains—and that these receive the highest rainfall. They almost wholly consist of impermeable material, throwing off the rainfall in floods; and are drained by rivers, in which the flood discharge and the dry-weather flow is utterly disproportionate; and were it not for the arresting influence of peat mosses, these streams would in dry periods be still more insignificant—the discharge being often 500 cubic feet per second per 1000 acres drained in flood, and only ¼ cubic foot flowing off the same area in dry periods. Probably one-third of the annual rainfall runs off in floods; and unless it is caught in storage reservoirs, such as Manchester and Liverpool have made, and Birmingham is making, the whole of this water for potable purposes is lost, as it becomes polluted as it passes to the sea. The author points out the advantages of these elevated areas for water-supply purposes. He then proceeds to remark that of an intermediate class are the millstone grit moorlands forming the Pennine chain and much of Northumberland and Durham. There is generally a series of porous grits and sandstone alternating with beds of very impermeable shale; and the water that percolates into the former is supported by the latter, and thrown out as springs, which, when delivered in the same drainage area, permit a catchment reservoir to collect not only the flood water but the percolated water, and make available—in the case of the Manchester (Longdendale) and Liverpool (Rivington) works—no less than 33 inches out of a total average dry-year fall of 45¾ inches. In these cases, the temporary absorption, storage, and delivery of the underground water form practically storage reservoirs, delivering a dry-weather flow of pure spring water. In such instances, on the millstone grit moorlands, unlike the silurian unpopulated areas, a teeming manufacturing population has insisted on Parliament compelling those who construct water-works to form large compensation reservoirs, often to the extent of the whole of the flood water passing down; and there is no doubt that millowners have largely benefited by the regular supply afforded them, instead of the capricious volume governed by elemental conditions. In many cases the conditions exacted are far too onerous, and point to the necessity of the formation of a Water Board in each important catchment area, selected by members of the county councils and county boroughs forming such areas, so as to give power of control from the source of each stream to its outfall. Parliamentary relief should be given from the penalty clauses of "compensation in bulk" when it was the opinion of the Water Board that a corporation had done all that could be reasonably expected; and corporations should be no longer compelled, after their compensation reservoirs were exhausted, to supply millowners with pure spring water, while human beings have to be put on short supply.

The amount of "average flow" of a stream, the author states, will be found to be far below the volume that would be yielded by a third of the annual rainfall; and the disparity is still greater when the "dry-weather flow" of the stream is compared with a daily average of one-third of the annual rainfall—pointing to the necessity of regulating the floods, which inflict great loss.

Mill and navigation works affect rivers chiefly through weirs—obstructions fixed across a stream, with a view to prevent water passing on until it has attained a certain head. Allusion is made to the varied requirements of land, fishing, and mill owners and navigation; and Mr. De Rance remarks that the burden of all Royal Commissions on this subject, and the consensus of opinion of all our eminent water engineers, is that without central control these varied interests cannot be reconciled. It appears to be necessary that there should be one authority for each river basin, with absolute control over its waters from their source to their tidal outfall.

Looking to the fact that the water used in this country for manufacturing and other trade purposes is so largely in excess of that required for drinking purposes, and that the value of a large area of land is in direct proportion to its facility of giving the water required by industry, it is inexpedient, in the author's opinion, that there should be any interference with the riparian rights of ownership, so long as such rights do not affect the public good; but the control of these rights might be safely left in the hands of a body (as suggested) acquainted with local requirements. Should a Water Board be appointed for each river basin, the author suggests means by which valuable water information might be obtained before it commences active operations; and he ventures to think it is also the duty of scientific societies to urge upon the Government the necessity of parliamentary power being given to county councils to sanction the small charge that would have to be made to obtain accurate records.

In the past, parliamentary inquiries, though carried out with infinite patience and care by Committees of both Houses, have been, and must ever be, liable to serious error—schemes being sanctioned that were impracticable from old mines beneath reservoirs, causing fearful augmentation of local rates; of embankments that were in most unsuitable situations; and of volumes of compensation water ordered to be given out of all proportion to the supply to be obtained. Even in inquiries by the Local Government Board on the spot, important interests are often sacrificed by facts not being disclosed. In all these cases were Parliament to make it imperative that a preliminary local inquiry be held by the suggested District Water Board, these dangerous results could not accrue.

An approximate estimate of the square miles of each geological formation or group of such in England and Wales is here given by the author, who (continuing), dealing with the degree of porosity of a rock, says it varies in direct ratio of the spaces between the grains of sediment of which it is constituted; the water being stored in the interspaces only—the quantity held varying from 0·185 of a gallon (a pint and a half) in a cubic foot content of granite to 1½ gallons in Bath oolite, and 2 gallons in chalk. Chalk and other limestones receive water with great rapidity, but part with it with exceeding slowness; there being a constant struggle between gravity and capillarity. It is important to distinguish between the amount of storage capacity and the actual volume annually absorbed from rainfall. When bands of permeable and impermeable rocks alternate, each porous band contains a separate sheet of water, which flows down the "dip planes" of the strata confined by the impermeable layers above and below. Such water flows with the "head," due to the difference of vertical level of the "area of outcrop" to that of the "area of discharge," less the frictional resistance of the fragments of the rock through which it passes. When the facilities for the discharge of a volume are less than the quantity capable of being received, the porous rock will be full up to the impermeable layer above, which is invariably the case when all outlet is stopped by faults throwing in impermeable strata. Such porous rocks may be regarded as underground conduits.

Pervious or permeable formations, by gradually absorbing waters falling on the surface, which slowly percolate through them, act at once as filter-beds and as reservoirs, the capacity of which is limited by the area of absorption and the thickness of the pervious bed. When rain falls upon a pervious rock overlying impermeable deposits, the water-line is generally near the surface, and forms the "plane of saturation," which is found to be slightly above that of the deepest valley intersecting the water-bearing rock, rising toward the centre of the hill, and varying within certain limits—being governed by the amount of previous rainfall. When wells are sunk into it, and excessive pumping takes place, the plane of saturation is artificially and locally lowered, and is known as the pumping-level. After a few hours' cessation of pumping, the water rises to its original level, or nearly so; the point so reached being the "rest-level." The difference between the "rest-level" and the pumping-level in some wells is as much as 100 feet. In selecting the site for a well, it must, observes Mr. De Rance, be always remembered that, if faults occur in porous rocks, the fissures of the fault will be filled with porous material; but they not only will be found to offer a water-tight barrier if an impermeable deposit be on the other side of the fault, but the same result is obtained if there was, at a former geological period, at the point in question, impermeable material on one or both sides of the fault, which has since been destroyed by denudation, as well as the upward prolongation of the fault which traversed it, which latter acted as a duct, or pipe, to fill the fissure of the fault, as at present preserved, with impermeable material, which has had the effect of converting it into a natural puddle trench.

Speaking of the competition for the possession of suitable water-bearing areas, the author says that rival townships often obtain the whole of the water rights of a district to the exclusion of those who, from apathy, ignorance, or want of funds, neglect to claim a portion of the natural watershed due to them. The Local Government Board and parliamentary inquiries, at the best, only endeavour to ascertain whether any proposed water scheme laid before them is likely to fulfil the purpose desired, and have no machinery to see whether it is the best scheme, or whether it will interfere with the interests of other districts, which, through ignorance, are not represented. During the present session, the opposition of the Nottinghamshire County Council has prevented the Nottingham Corporation obtaining water they so much required from wells in the new red sandstone, on the mistaken notion that it must necessarily be at the expense of the streams which

are only running off a small quantity of water altogether out of proportion to the quantity percolating, which is going to waste down the dip planes of the strata. Similarly, the opposition of the Hertfordshire County Council has caused the House of Commons Hybrid Committee on the London Water Bills to reject the proposal of the New River Company to sink additional wells in the chalk north of Hertford, to obtain water which is now running to waste under the Essex tertiaries and the bed of the River Thames in that county, but have sanctioned the retrograde step of impounding gravitation water at Staines, for the use of the New River and the requirements of other London Companies. Such reservoirs are retrograde as impounding surface water, always more or less suspicious, if not absolutely dangerous, as occupying flat meadow tracts of large extent suitable for providing foodstuff for cattle, being an interference to transit and other purposes, where such reservoirs are placed in well-inhabited districts, and even in those near sites where the land is in a good state of cultivation.

It is worthy of note, points out the author, that whenever Parliamentary Committees have to choose between a gravitation scheme and an underground scheme for public supply, their sympathy is invariably in favour of the former, with the result that valuable land is precluded for good from exercising its natural functions of yielding crops or forming sites of towns, to store indifferent waters; while the rocks beneath, or within reasonable distance, could yield the same quantity of water at a tithe of the expense, and of a thoroughly pure quality after passing through the pores of the rock. Thus the new red sandstone is described by the Royal Commission as the most effective filtering medium known; every trace of organic matter being converted into innocuous compounds. Its value can be realized when its extent in England and Wales is found to be no less than 10,000 square miles, and it is remembered that 1 inch of rainfall gives 22,427 gallons per acre, or 14,353,280 gallons per square mile, which, spread over a year, yields a daily average of 40,000 gallons per square mile. Experience in South Lancashire and elsewhere has shown that 10 inches out of a 30-inch rainfall can be pumped up—probably a larger quantity generally percolating. At Liverpool, four public wells yield an unvarying quantity of 6 million gallons of water daily. At the Nottingham and Wolverhampton Water-Works, individual wells have yielded more than 3 million gallons daily for a long period. At Gainsborough, a very eminent engineer advised the Water Committee that the well the author had recommended them to sink through the Keuper marls would decrease in yield, and that they should revert to pumping the River Trent. But experience has since proved that this is not the case, and that the ample supply the town now obtains is derived from the rainfall of an area eight or nine miles distant, which, previously to the artesian wells being sunk, was passing beneath the town to waste on its way to the sea-bed.

By common law, underground water is free to all who have a legal right to hold it, with the proviso that if one does not use he must not spoil it. But though one may not spoil the water under a neighbour's house, he may pump it all out, and let his neighbour's foundations down, destroy his house, or subside an adjacent railway; there being no right "of support in water." These matters, though the law of the land, appear to be contrary to equity, and demand careful consideration, with the other points to which attention has been drawn as regards future legislation; and equity demands that changes should be made in the common law. Questions of damage from pollution might well come before a Water Board of the district; for the complexity of the conditions points to the necessity of the possibilities of damage from many causes being prevented by giving greater powers to the Local Government Board. If each district had its own Water Board, it could communicate direct with the department, formulate its wishes, and point out the necessity of their advice or of a local inquiry.

The author makes some pointed remarks as to brine pumping, and says that, if the common law should be altered, the matter of subsidence for the removal of material in chemical solution by pumping should obtain attention. He also gives the information that in the chalk area, every million gallons of water pumped abstracts from the chalk 1¼ tons of that material through which it has percolated, giving an additional storage for 110 gallons of water.

In conclusion, the author says he is of opinion that—looking to the complexity of the existing water law, vested interests in the parliamentary costs of obtaining the existing powers, and the far larger capital expended in carrying out works so sanctioned, for various purposes affecting water on the one hand, and the necessity of dealing with the same for the public good on the other hand—decisive, but progressive, steps in legislation are absolutely requisite; and he is of opinion that the varied, and often antagonistic, requirements, and the necessary funds to deal with various interests, cannot be incorporated in any General Act of Parliament. He ventures to suggest that it is advisable that: (1) County councils, or groups of the same, be given powers by Parliament to form "Water Boards;" (2) that such Boards have power of control of all water within their area in three stages—(*a*) direct; (*b*) with Local Government Board sanction, after local inquiry at the suggestion of the local authority; (*c*) after parliamentary inquiry and approval of the modification of existing rights and previous Acts, subject to monetary compensation when rights, exercised under parliamentary powers, are affected.

Discussion.

Mr. P. Edinger (Frome) stated that the town with which he was connected was subjected to very heavy floods. In 1882, in the market place, they had 4 ft. 6 in. of water; and in 1889, 8 feet. The ratepayers were induced to form a kind of Water Board; and from the subscriptions, they gave a gratuity every Christmas to the men in charge of the mills about the town. This had had a marked effect—indeed, there had been no floods since 1889.

Mr. W. Watts (Oldham) could not see how floods were to be prevented, unless large storage reservoirs were constructed in the higher reaches, to minimize the floods which otherwise would go down the stream. In his opinion, these floods were necessary for the health of the district. He thought too much had been made of the power given to the riparian owners in constructing hydraulic works. Hitherto, they had claimed something like one-third of the annual or average rainfall; and the water had to be sent out at specific times to meet their convenience only, while others on the stream were practically denied many of the privileges that an ordinary and regular flow would give. Mr. De Rance's paper was one of great power and thought; and it required more consideration to deal with it than they could devote to it that day.

Mr. J. Shaw (Boston) said, though it might be presumption for him to differ from Mr. De Rance, he must express his disbelief that there was such a large volume of water travelling in the chalk. In 1878-80, he was in a part of Surrey—a chalk district—which was served by three water authorities. One pumped the water from nearly the outside of the higher part of the chalk; the second, half way between; and the town of Croydon at a place where the chalk disappeared under the London tertiaries. At the time, it certainly appeared to him there were not these large volumes of water passing under the chalk; for while the Croydon Water-Works could always pump about 3 million gallons a day, and sometimes ran up to 10 million gallons, and the water in the well only lowered 10 feet from the highest to the lowest water-level, when they went to the outside of the chalk, one well varied as much as from 130 to 140 feet. This would prove that there was a reservoir in the chalk; but nothing like the reservoir that some people had asserted there was. One inch of rainfall sent up a particular well in twenty-four hours more than 40 feet; so that the quantity of water required to fill up that reservoir 40 feet was not large. As to the statement that 1¼ tons of chalk was taken out of every million gallons of water pumped, he (Mr. Shaw) did not believe this was extracted from the underground reservoir. When the rain fell on the chalk, it met with some vegetable acid, which dissolved the chalk much above the level of saturation, and that was the chalk that was worn away, and not underground, where it would give greater storage capacity.

Mr. W. Terrey (Sheffield), referring to the paragraph in the paper in which the author stated that "for a tithe of the expense" of a gravitation scheme, the same quantity of water could be obtained by pumping works, said this appeared to give the impression that the cost of water pumped was something like one-tenth of that obtained by gravitation; but he did not suppose that was quite the meaning Mr. De Rance wished to convey. He (Mr. Terrey) had found that in upwards of thirty of the principal towns in England, the cost of producing a million gallons of water per day by gravitation works was about £129,000; whereas in thirty other towns the average of pumping the same quantity was only £101,000. Of course, they all knew that the expenses of obtaining and distributing the supply of pumping works as against the gravitation were infinitely more. The working expenses in connection with gravitation works from thirty towns were, he found, 1·28d.; and, as they would expect, in the case of pumping, they were just double—2·45d. With gravitation works, they had complications with millowners; large tracts of land were required; and the capital charges were more. On the other hand, for pumping, working expenses, interest on sinking fund, and redemption worked out to 6·6d., as against 5d. for gravitation works. So that the cost was decidedly in favour of gravitation schemes.

Mr. J. A. Paskin (Halifax) mentioned that, during the sitting of the Royal Commission on the Metropolitan Water Supply, the statement was made that the cost of pumping 1000 gallons 100 feet was ¼d.

Mr. J. Storr (Wrexham), alluding to the remark of Mr. De Rance that often, with a discharge of 500 cubic feet of water per second per 1000 acres drained in flood, only a quarter of a cubic foot would flow off the same area in dry periods, said that from gaugings he had made upon 1500 to 1600 acres of the millstone grit, especially during the recent very dry season, he found that the yield per 1000 acres was only one-fifth of the latter quantity stated by Mr. De Rance. This was really one reason why gravitation schemes were unable to meet the seasons of drought that were falling upon us.

Mr. T. Raynes (Birmingham), supporting Mr. Paskin's statement, said at Birmingham the pumping costs were ¼d.—say, from ⅛d. to ⅜d.—per 1000 gallons per 100 feet.

The President (Mr. D. M. F. Gaskin) agreed that ¼d. was about a fair average.

A vote of thanks was passed to Mr. De Rance for his paper.

THE PRINCIPLES OF GAS HEATING, WITH AN EXAMPLE.

The invention which it is the purpose of this article to bring under our readers' notice more particularly than was done when, in the ordinary way, an abstract of the patentees' complete specification appeared in our "Register of Patents" (see Vol. LXVII., p. 1036), is an example of a type of gas heating-stove which, in the interests of gas companies and gas consumers, ought to be given fair trial and every possible encouragement. We all know the common commercial type of gas heating-stoves, in which an atmospheric burner is caused to heat up, to the point of more or less efficient radiation, a pile of so-called asbestos and fireclay "fuel." Like the dry gas-meter, this type of stove has a vogue wholly out of proportion to its merits as a scientific adaptation of means to ends. It would be doing injustice to the meter, however (which works, as a rule, with a degree of accuracy that was never expected of it by those who knew the principles of its construction), to continue the parallel. For the gas-fire is unquestionably an extravagant arrangement, yielding a poor return for the gas it consumes, and only tolerable by reason of its great practical convenience. The most that can be said for it is that in localities where gas is cheap, the best articles of the kind can be used by the householder for a certain range of applications with a good deal of comfort, and not at too great a cost. Moreover, the makers of this class of gas

FIG. 1.

apparatus have of late years applied much ingenuity with a view of rendering them presentable, and of overcoming the acknowledged disadvantages of noise in lighting and in use, and the liability to "fire-back" through the influence of a draught of air, or when turned low. The question of efficiency, however, in converting the heat of burning gas into warming effects by the combined agency of an atmospheric flame and a mass of refractory radiating material, remains precisely where it has been any time these last thirty years and more; and the only improvement that it has been found possible to make in the warming effect of gas-stoves constructed upon this principle has been by adjustments of the casing tending to promote circulating air currents.

The truth of the matter is, of course, as Frederick Siemens was the first to point out, that it is fundamentally wrong to use flames for heating in the manner described—of causing the live flame to impinge upon an inert substance. If this misuse of flames is perpetrated upon those that are luminous, the consequence is familiar and of an unmistakeable character—the flame is partially extinguished by the cooling action of the inert surface, and soot, which is plainly unconsumed and wasted carbon, is deposited, in eloquent reproof of the user's ignorance or carelessness. It is precisely the same with the non-luminous flame in effect, though not in appearance, because the admixture of air causes a more local combustion of the carbon; so that the result of the cooling effect of the inert surface upon which it impinges does not take the same shape as in the case of the luminous flame. The result itself, however, is equally inimical to the rendering by the maltreated flame of its proper useful duty, as another warning, addressed to the user's sense of smell, amply indicates when the unconsumed combustible is not smuggled away by chimney ventilation. Notwithstanding this consideration, the making and selling of atmospheric gas-fires and stoves in which this prime condition of efficiency is systematically neglected goes on under the excuse of practical convenience.

It would be a blunder of great magnitude if gas engineers, and those who are more concerned with the popularization of

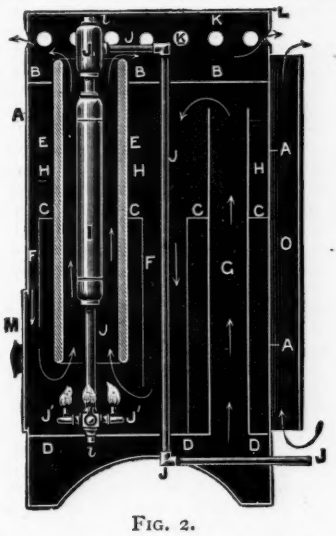


FIG. 2.

gas as fuel than with the trade in the makeshift type of appliances put upon the market for sale in connection with this praiseworthy movement, were to lose sight of the correct principles of gas heating. Considerations of practical convenience are very well in their way; and far be it from us or from anybody else to despise them. They are, however, after all, of merely commercial validity, and rest on no other foundation. There is a large trade done in atmospheric gas-fires, notwithstanding the diffidence of gas managers in recommending them to consumers to whom the size of the gas bill is an object. But the drawback to this is the frequency with which gas-fires are turned out of the houses where they have made the wheels of the meter index go round faster than the householder could tolerate.

Whatever may be their claims to popular favour, it is at any rate certain that there is no prospect of improving gas-fires upon the conventional lines. Makers may put them in more and more fanciful casings, and call their creations by all manner of catching titles; but the atmospheric burner and the inert radiant substance are at the end of their development, which means that there is no further scientific interest in their connection with the problem of economical gas heating. It is altogether different with the application of the luminous flame to heating purposes. Here, to begin with, the path of scientific rectitude is entered upon. It does not matter whether or not a gas-flame is rendered "atmospheric;" the proper way to burn it is to keep it from contact with anything but the air, until it has burnt itself out. Only, if we are going to do this, there is no reason for mixing air with the gas before ignition; while there are several objections, having regard both to economy and convenience, why this admixture should not be permitted. In the first place, the luminous flame of coal gas possesses a certain amount of power to radiate heat as well

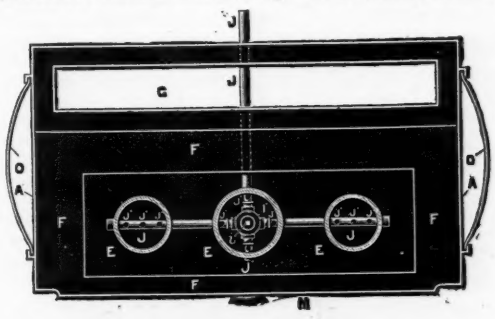


FIG. 3.

as light; and this proportion of its total heating effect is destroyed, never to be recovered, if it is rendered non-luminous by the addition of air before being finally burnt. Then, of course, the luminous flame is more easily produced and quieter than the atmospheric flame, especially when, as in most gas-

fires, the latter is generated at outlets ranged along a horizontal supply-pipe.

The common, plain flat-flame gas-burner is the most efficient "gas-fire" known to science; and the most hopeful way of making a stove out of it is, first, to place it under safe cover as near the ground level as possible; secondly, to increase its radiant and total heating effect by warming the gas supply as much as it will bear, and heating, as much as possible, the air required to promote combustion; thirdly, to promote the diffusion of the local heat by a suitable disposition of the convection currents. If there is anything else to be done, science is silent on the subject. The easy attainment of these few and simple objects has been hampered, for many minds, by the supposed necessity of making special provision for getting rid of the products of combustion. Certainly, the presence of combustion products in the air of an apartment is initially objectionable, whether these products come from the combustion of hydrogen and carbon in gas or oil flames, or of carbo-hydrates in the animal lung. But in this connection it is desirable not to lose sight of the element of proportion, and especially not to "strain out the gnat and swallow the camel." There is a necessity, for instance, for getting the partially-burnt products of an atmospheric gas-fire away up the chimney before they have a chance of escaping into the room; and this type of gas-stove is as great a nuisance as a coal-fire where the chimney draught is bad. Moreover, the quantity of gas burnt in any effective gas-fire is something considerable; and its products would render the air of any ordinary room unbearable, even if they were devoid of odour. Of late years, however, the extensive use of so-called oil heating-stoves, which are nothing but large oil-lamps, precisely the same as are used for lighting, without pretence to special ventilation, has greatly helped to prepare the public for a similar use of gas. The truth of the matter is that the consumption for warming purposes of gas in a safely-made stove for standing on the floor, will not exceed in quantity that burnt in the ordinary way for lighting the same apartment; so that there is no more need for special ventilation in the one case than in the other. This statement does not mean that the best attainable ventilation is not desirable under any conditions of occupation or heating; but only that free-burning gas-flames do not need it more when used for warming than when they light an apartment.

Having gone so far into general principles, we can now descend to show how these are embodied in the gas heating-stove of Messrs. Morton and Pringle, which has been termed, for registration purposes, the "Omedwâr," and is illustrated herewith. Essentially, it consists of an arrangement whereby clusters of small flat-flame burners function under cover, in a heated atmosphere. The drawings almost explain themselves. Fig. 1 shows the general appearance of the stove, as enclosed in a plain case; Fig. 2 is a sectional elevation, taken from front to back, showing how the heat-recuperative effect is produced; and fig. 3 is a plan. Without referring to all the letters, it will suffice to state that the burners J are placed underneath fire-clay tubes E; this material being selected for the hottest situation because of its inoffensiveness when heated as compared with iron. The gas-supply pipe J is in one of these tubes, which it nearly fills; the part of it exposed to the heat being enlarged and made of copper. Very few of the hot products of combustion can pass between this pipe and the fire-clay tube, so that the gas does not get overheated. The course of the air currents is shown by the arrows; and it must suffice to state that the air does get very hot by the time it arrives at the point of combustion. The great art in constructing the apparatus has lain in adjusting the air channels and other elements of the apparatus to the duty required of them. The gills O are aids to air circulation.

It is not for us to say more of this appliance than to testify to the fact that such a stove can be very cheaply made, and put upon the market at a low price, while whatever heat there is in the gas consumed is very completely utilized. From an article published in the "Lancet" for the 25th ult., it may be gathered that "this stove in heating efficiency is superior to any single stove examined by the 'Lancet' Commission;" and the reporter speaks highly of its hygienic qualifications. These are referable in the first place to the small quantity of gas consumed; and, secondly, to the very complete combustion realized by feeding the flames with hot air. Technically, the appliance is an interesting example of the adaptation of sound scientific principles, by an exceedingly economical method of construction, to a useful end. Incidentally, it may be remarked that the humidity of the air of a room is unaffected by this method of warming, which is an important consideration in cases of sickness. Altogether, we have not yet seen a gas heating-stove which we could more confidently recommend for trial on its merits than the "Omedwâr."

An Economical Conveyor Maker.—Messrs. Little and Graham, Limited, of Smethwick, have added to the plant at their works a large machine designed specially for the automatic manufacture of the chief parts of conveyors and elevators. As a sample of what the machine can do, about a week ago fourteen large conveyors, to carry coal at the Royal Arsenal, Woolwich, were made in two hours, at a cost for labour of about ¼d. per foot, as compared with 1s. by former methods of manufacture.

THE PREPAYMENT SYSTEM IN LILLE.

Our readers will doubtless remember that, on the occasion of the annual congress last year of the Société Technique du Gaz en France, M. Melon, of Lille, gave a few particulars as to his tentative efforts to introduce automatic prepayment meters in that city. At the recent meeting of the Society, he supplemented them with the results obtained in eleven months of actual working. The success which has attended his enterprise has exceeded all his expectations; and the movement, once started, does not seem likely to stop. Each week brings about a hundred new consumers; and there appears to be no reason for supposing that the saturation-point has been anything like reached. Indeed, when it is considered that Lille has 220,000 inhabitants, and that the villages and suburban communes contain 80,000—making a total of 300,000 inhabitants in the areas lighted by the two Companies (the Imperial Continental Gas Association and the Wazemmes Company) serving the district—and when, on the other hand, it is noted that the number of consumers on April 30 last was only 14,725, or 1 in 49 of the inhabitants, the saturation-point is a long way off. M. Melon thinks he is not guilty of any undue rashness in expressing the hope that he will bring the proportion a little closer—in fact, to 1 in 10—in Lille, where all the advantages and facilities afforded by the prepayment system are placed at the disposal of the residents. He is confident that the number of consumers will be rapidly doubled; and seeing that there has been an increase to the extent of 22 per cent. in ten months, he considers that there is ground for expecting that by the end of the century he will have secured the 30,000 consumers required to make the proportion that which he is seeking to attain.

The author presented his results in a series of tables, some of which it will be of interest to reproduce. The following statement shows the increase in the number of consumers month by month for the two Companies:—

Month.	Prepayment Meters.			Ordinary Meters.		
	Wazemmes.	Lille.	Total.	Wazem.	Lille.	Total.
1895.						
June	657	69	726	18	5	23
July	112	73	185	16	..	16
Aug.	145	125	270	23	16	39
Sept.	188	86	274	21	5	26
Oct.	118	76	194	18	4	22
Nov.	154	44	198	15	9	24
Dec.	123	99	222	16	..	16
1896.						
Jan.	105	87	192	18	15	33
Feb.	228	53	281	12	2	14
March	239	80	319	8	7	15
April.	243	94	337	7	..	7
	2312	886	3198	172	63	235
Average of the last ten years				188	53	241

This table shows a total of 3198 prepayment consumers, or an average of 296 per month; and 235 ordinary consumers, or an average of 21 per month. It is interesting to note that in the last ten years the average increase has been 22 per month—a number which agrees pretty closely with that recorded for the months in the period embraced in the table. It will thus be seen that the introduction of prepayment meters has in no way prejudiced the increase in the number of ordinary consumers; and it may be reasonably assumed that all the prepayment meter consumers are people who would have remained indifferent to the use of gas if there had not been offered to them a new appliance which gave them every satisfaction. The number of prepayment meter consumers secured by the Wazemmes Company in the eleven months is equal to the number of ordinary consumers obtained by them in thirteen years; and for Lille, it was equal to the new ordinary consumers coming upon the books during seventeen years.

The next table shows that the general increase of consumers has been 22 per cent. In the case of Wazemmes, the number of prepayment meter consumers on April 30 last was 26 per cent. of the whole; while in that of Lille, it was 16 per cent.

Number of Consumers.	Wazemmes.	Per Cent.	Lille.	Per Cent.	Total.	Per Cent.
June 30, 1895.						
Ordinary meters	6645	91	4657	98	11,302	93
Prepayment do.	657	9	69	2	726	7
Total.	7302	100	4726	100	12,028	100
April 30, 1896.						
Ordinary meters	6817	74	4710	84	11,527	78
Prepayment do.	2312	26	886	16	3,198	22
Total.	9129	100	5596	100	14,725	100
Increase.	1827	26·4	870	18	2,697	22

In the following table, the author shows how the prepayment meter consumers are distributed:—

Avocations.	Waz-emmes.	Per Cent.	Lille.	Per Cent.
Wineshop-keepers and retailers of beverages	622	26·90	190	21·45
Clerks, merchants, doctors, engineers, students	465	20·11	175	19·75
Foremen, indoor workers (tailors, bootmakers, &c.)	408	17·64	204	23·03
Bakers, grocers, butchers	325	14·05	93	10·49
Drapers, ironmongers, hairdressers, laundrymen	322	13·92	78	8·81
Officials, railway employees, teachers	170	7·38	146	16·47
Total	2312	100	886	100

It will be at once seen that the largest proportion consists of wineshop-keepers and small retailers, and of foremen and workmen living in flats. Up to the present time, the working classes proper have scarcely been touched; but from quite recent results, it is expected that a large number of consumers will be found among them.

Some interesting particulars are furnished by the remaining tables. There were 951 prepayment meters placed in the houses of those who had discontinued using gas, but had retained their service-pipes and fittings. It was the abolition of the deposit, and the absence of the monthly gas bill, that caused these people to have prepayment meters. There were 55 ordinary meters replaced by the new kind; and of these consumers 19 were unsatisfactory on the old system—being more or less bad payers. Figures are given with regard to the prepayment meters removed and replaced by those of the ordinary kind, as well as to the number taken out altogether. In the course of eleven months, there were 22 cases of breakage of the money-boxes; and 23frs. 50c. were lost—the result of six consumers "moving" in the night, and carrying off the box with them. This is not a heavy loss, seeing the total receipts in the period covered amounted to 92,034frs. (£3681). The highest average monthly consumption of gas per consumer was 29 cubic metres (1024 cubic feet) in December; and the lowest, 10 cubic metres (353 cubic feet) in May. The total consumption for the eleven months was 368,136 cubic metres in Lille, or an average of 24 cubic metres per meter per month, corresponding to an annual consumption of 288 cubic metres per annum. The author believes this to be a minimum figure, which is certain to be very soon exceeded. Indeed, he shows, by one table, that 2894 cooking-stoves have been placed with consumers by the prepayment meter system.

M. Melon describes the means adopted to push the new system. In the first place, a special notice was inserted in all the newspapers of the district every week; and afterwards a prepayment meter in action was fitted up in the office of one of the most important papers in the centre of the town. Then leaflets, generally describing the system, were distributed by the outdoor staff in all houses where no meter had been fixed. A few days later, these officials called at the various houses and presented an agreement for signature. To stimulate the efforts of the staff, premiums of 3frs. to 5frs. were granted if they succeeded in getting prepayment meters introduced into the houses of new consumers, or in those in which fittings were already in existence. M. Melon attributes his success mainly to the excellence of the measures adopted to push the system; and he says he has only to continue awarding the premiums to ensure its continuance. All other methods are useless. Every prepayment meter placed in a house becomes a centre around which the consumers increase of their own accord.

There only remains the question of economy. Speaking generally, the two Companies concerned have spent about 400,000frs. upon the new installations; 212,000frs. being for meters, and 188,000frs. for service-pipes and gratuitous fitting. The usual charge for gas to private consumers is 20c. per cubic metre (4s. 6d. per 1000 cubic feet); and 5c. is put on to cover the cost of the installation of the prepayment meters. This additional charge is expected to bring in about 15frs. per meter per annum. The annual product of the 3197 meters will be 47,955frs.—a sum sufficient to liquidate in four years the expenses of the installation; but supposing the annual consumption per meter does not reach 300 cubic metres—that it does not exceed, for example, 250 cubic metres—the expenses of installation could still be easily wiped off in six years. It is scarcely necessary to remark that the considerable profit which should accrue to the Companies by this rapid increase in the number of their consumers will allow, if necessary, of the more rapid amortization of the important capital sums they are led to sink in these new installations.

Deep Artesian Borings.—In the course of his Inaugural Address at the recent meeting of the British Association of Water-Works Engineers, the President (Mr. D. M. F. Gaskin) referred to the Gil-Gil boring in New South Wales. A recent report to the Minister of Mines states that the boring has reached the contract depth of 3033 feet; and, as the yield is upwards of 2 million gallons per day, the bore will not be carried farther down.

REGISTER OF PATENTS.

Prepayment Gas-Meters.—Cowan, W. & W. H., of Edinburgh. No. 13,200; July 9, 1895.

This invention in prepayment gas-meters is a modification of, and addition to, patent No. 21,108 of 1894. It relates to the coin-actuating mechanism of the meter, as illustrated in the engravings.

Fig. 1 is an elevation, fig. 2 an end elevation, and fig. 3 a plan, of one method of carrying out the invention—the covers of the meter being removed for the sake of clearness.

Fig. 1.

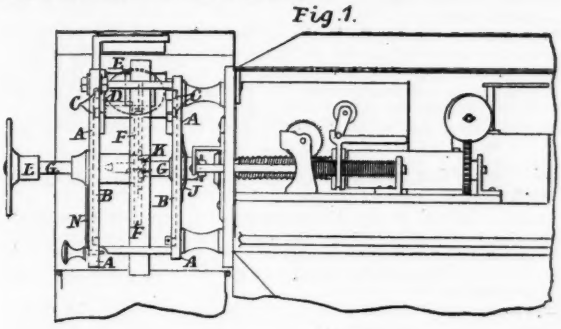


Fig. 2.

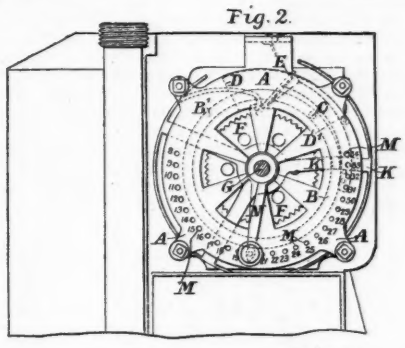
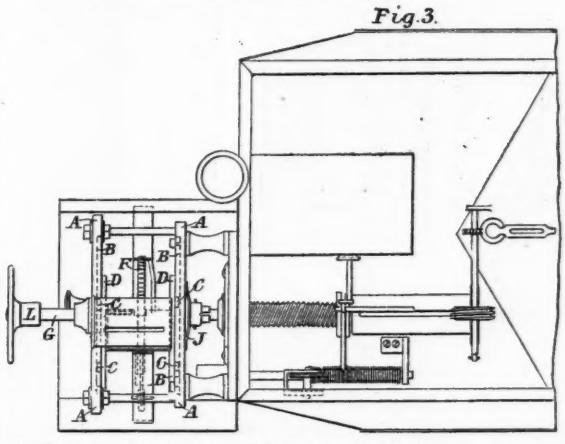


Fig. 3.



In the meter there are two suitably shaped standards or supports A, each provided with a circular groove or slot B on its inner face, in which work guiding pins, ribs, or bars C of a circularly-moving coin-carrier or carriage D, which has its coin pocket or receptacle placed at a suitable angle, so as to determine the angle of the coin E in relation to the angle of the teeth of the prepayment-wheel F when the coin is placed in the pocket. There is also a coin-retaining bar or rod provided in the pocket. The standards also carry the shaft or spindle G for the prepayment-wheel F. This spindle is mounted in line with, and is suitably connected to, a screwed rod or tube or outer tube or casing, for actuating the valve or stop of the meter, as described in the earlier patent.

Between the standards and on the spindle is mounted the prepayment-wheel F, which has its teeth cut with their sides preferably at an angle of about 45°, so as to enable the coin to engage with them and actuate the wheel F in such a manner as to place a quantity of gas at the purchaser's disposal equal to the value of the coin inserted. The prepayment-wheel is provided with a gripping spring J, on the spindle G, upon which the prepayment-wheel F is mounted; and this spring is caused to work against the outside face of the inner standard A.

In order to operate the prepayment-wheel so as to purchase gas, there is a suitably-shaped pusher K, capable of being turned round (or partially around) a circle, by means of an outer knob or handle L, which, along with the pusher K, is connected to a sleeve capable of being revolved round (or partially around) a circle without actuating the spindle G or prepayment-wheel F in the event of no coin being in the pocket. The pusher K is provided with a shutter, for preventing the insertion of a coin except when the mechanism is in its normal position; one portion of the shutter acting as guard for retaining the coin in the pocket. The pusher is connected to the carrier or pocket by means of an adjustable slip-rod arrangement, so as to enable it to be brought back into its normal position along with the pusher.

In order to permit of variations in the price of gas being allowed for, there is a pointer and scale arrangement, such as described in patent No. 11,537 of 1890. Or (as shown) the pointer and scale arrangement may be formed as a single circle M (or part of a circle) of holes in one of the standards or supports A, into which the binding-screw of the pointer N would engage; and the inner end of the screw would thus regulate the amount of travel that the carrier D would have.

After the coin has been placed in position in the pockets of the carrier D, the carrier itself is turned round, by means of the outer knob or handle L and pusher K, till it reaches the inner end of the binding-screw, in which position the coin-retaining portion or guard is below the coin while keeping the coin in contact with the teeth of the prepayment-wheel F.

When turning the handle in the opposite direction, the pusher K (with the coin-retaining portion and guard) is turned round for a short distance without operating the coin-carrier D and pocket, till it reaches the end of the slip-rod arrangement and draws the coin-retaining portion from below the coin, and allows it to drop out. The remainder of the travel of the pusher K brings the carrier back to its normal position.

Manufacture of Gas from Oil.—Foulis, W., of Glasgow. No. 15,048; Aug. 9, 1895.

The object aimed at by the inventor is to "provide a retort or retorts, and means for heating it or them, and means for introducing the oil in such a form or manner that the oil becomes vaporized, or in great part vaporized, without coming in contact with the hot internal surfaces of the retort or retorts."

The patentee prefers to use two vertical retorts, provided with means for heating them by producer gas. The oil to be gasified is admitted from the upper part of the first retort preferably by means of an inlet-pipe and nozzle, through which it is injected against a plate or disperser, so as to be broken up into a fine spray or "mist," and in great part vaporized before any considerable quantity of it can come into contact with the heated inner surfaces of the retort. The vapour of oil, partly gasified in the first retort, passes into the second retort, in which its conversion into gas is completed.

The accompanying illustrations represent in vertical section in fig. 1 and plan in fig. 2 apparatus constructed in accordance with this invention. Fig. 3 is a section of the pipe and attachments by which the oil is fed into, and distributed in, the retort.

Fig 1.

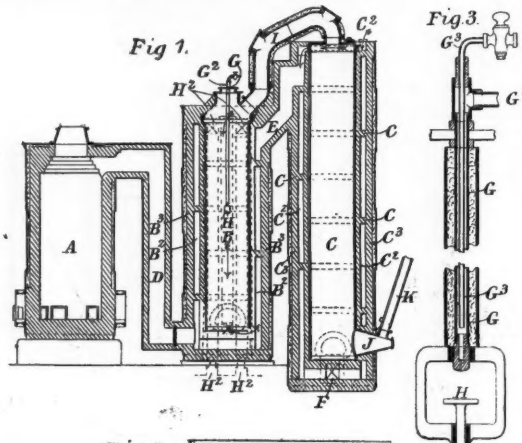
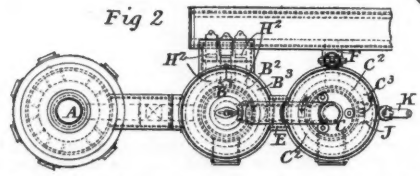


Fig 3.

Fig 2

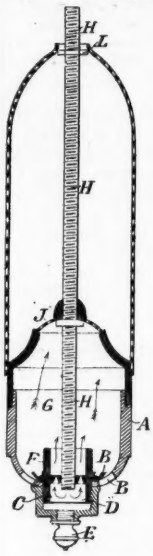


A is a gas-producer or other suitable heater, and B and C are the two retorts. Surrounding the retorts are casings or enclosures B^3 C^3; leaving spaces E^2 C^2 between their interiors and the outsides of the retorts. The space B^2 is connected to the heater A by the passage D, controlled by a damper; and the spaces B^2 and C^2 are connected by the passage E. The passage F from the space C^2 leads to an outlet chimney or flue, and is controlled by another damper. H^2 are passages from the space B^2, also leading into an outlet chimney or flue; and these are capable of being controlled by dampers. Baffles are arranged in a helical manner in the spaces B^2 C^2, so as to cause the products of combustion from the heater A to take a circuitous path through the spaces B^2 C^2. Air-openings, controllable by dampers or valves, admit air to the spaces B^2 C^2, so as to regulate the temperature required at various parts of the retorts. The air is preferably conveyed through channels formed in the casings, so that, as it passes in the direction shown by the arrows, it becomes heated before it enters the spaces B^2 C^2. The channel in connection with one opening is formed between the outlet-passages H^2 from the space B^2; and the channel from the other opening is led half way round in the top of the casing of the retort C^3. G is an inlet-tube in connection with the oil-supply pipe G^2, and having at its end which enters the retort B a nozzle, opposite to which is a dispersing plate or surface H, by which the oil is broken up into fine spray for the purpose already explained. G^3 is a pipe, provided with a cock for allowing air to readily escape; while the oil-tube is preferably surrounded by a bad conductor of heat. The vapour of the oil passes from the first retort B, by the passage I, into the second retort C, in which its conversion into gas is completed; and it leaves the second retort by the passage J.

The heat of any part of the apparatus (or of the escaping gas) may be utilized to heat the incoming oil—for example, the outlet-pipe may be surrounded by a casing K, provided with a connection to which a pipe attached to the pipe G^3 is attached. By manipulating the dampers which control the air-inlets, and those which control the outlets from the space B^2, the temperature at the various parts of the apparatus can be regulated as desired.

Incandescent Gas-Burners.—Hancock, D., Craig, J. B., and Hancock, A. H., of Stratford, Essex. No. 15,423; Aug. 16, 1895.

The object of this invention is to so construct atmospheric gas-burners (particularly applicable for incandescent gas lighting) that they may be applied with equal facility to either a vertical or wall gas-bracket, or may be applied to a hanging or ceiling fitting—that is, the burner may be supported from its lower part or may be suspended by its upper part.



The outer casing A has holes B in it for the admission of air; and into the casing is screwed a fitting C, having a central hole, the lower end of which is enlarged to form a chamber D. The fitting C is screwed externally to take into a cap, by which it is held in place; the cap being formed with a hole screwed internally to receive a plug E. This aperture is so that the burner may at times be applied to a vertical bracket. Around the centrally enlarged part or chamber D, are gas-admittance holes F, communicating with an annular space G. The upper end of the fitting C receives a tube H; and upon the top of the casing is a circular disc or piece of wire gauze or like material J, having a central hole in it to allow the lower screwed end of the tube to pass through. Upon the tube H is arranged an incandescent hood or mantle support L, which can be adjusted to any required height by the screw-thread upon it.

When it is wished to apply the burners so as to receive the gas supply from below by a vertical bracket, the plug E is removed from the bottom of the burner, and the base of the burner is screwed on to the gas-bracket. The gas will then pass through the holes F in the top of the chamber D, and into the annular space or mixing chamber G; the holes being so situated that the gas passes up near the air-admission holes B, drawing sufficient air, which, together with the gas, passes up through the gauze disc J, where it is ignited and burns within the suspended hood.

Supplying Steam, &c., to Telescopic Gasholder Cups.—Horton, G. A., of King's Cross, N. No. 15,521; Aug. 17, 1895.

This invention refers to apparatus for the supply of steam, hot water, or other fluid, to the cups of telescopic gasholders, to melt ice, prevent the water being frozen therein, compensate for leakage, or for other purposes.

Fig 1.

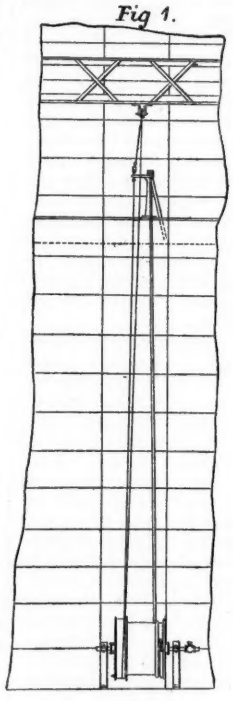


Fig 2.

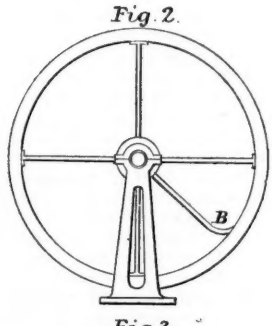


Fig 3.

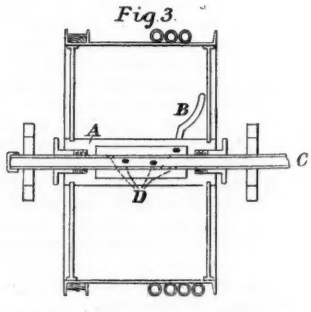


Fig. 1 is a front elevation of a portion of a telescopic holder with this invention applied, with the outer lift almost at its highest elevation. Fig. 2 is a side elevation of the drum, which forms the chief novelty in the invention; and Fig. 3 is a horizontal section through the centre of the drum.

At a point on the edge of the tank is placed a drum, round which flexible tubing, for the conveyance of steam or water to the cup of the holder, is coiled when the cup is at its lowest point. The drum has an inner case or steam-chest A, which is the receptacle for the steam, water, or other fluid, from whence it is conveyed to the outer sides of

the drum by the pipe B, and so to the end of the flexible tube, which is attached at this point. A shaft or axle C passes through the centre of the inner case, which has a stuffing-box at either end, to make it steam or water tight. This axle, which may be made of a piece of hydraulic or other tube, is fixed to suitable supports, and is drilled for the admission of steam or water at D, and to one end of which the steam or water connection is made. The inner case and outer drum being stayed well together, revolve round the axle. Suitable bib-cocks are inserted for lubrication, and to run off any condensation where steam is used. The other end of the tube is supported by a short standard attached to the grip, and from thence dipping down into the gasholder cup.

For the purpose of winding up the slack of the flexible tube as the holder sinks, a wire rope, chain, or cord is attached at a point on the other end of the drum, and, passing round the drum in the reverse direction to that of the flexible tube, runs over a pulley wheel or wheels suspended from the gasholder framing, and from thence is attached to the grip. Or (alternately), instead of attaching the end of the wire rope to the grip of the gasholder, a counterpoise weight may be attached thereto. In the case of the wire rope being attached to the grip, the diameter of the drum at the end round which the wire rope coils is so proportioned as to compensate for the difference in diameters of the wire rope and flexible tube, and thus avoid slack on either.

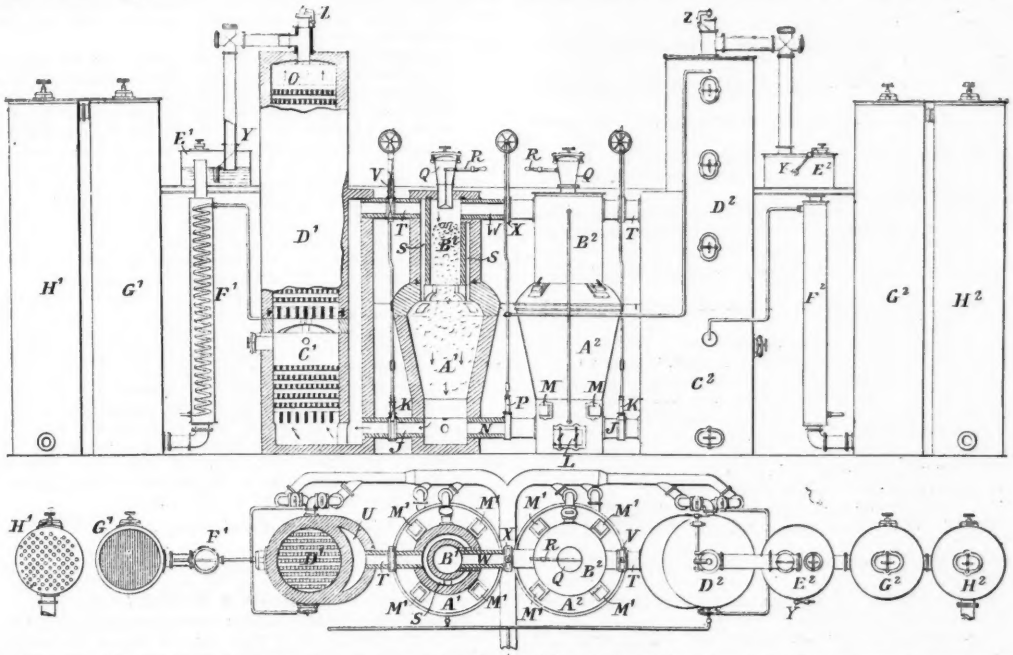
The action which takes place is as follows: When the holder rises, the flexible tube unwinds from the drum, while the wire rope or chain is coiled upon it; when the gasholder sinks, the reverse is the case. Or, the wire rope having passed round the drum, and one end over an elevated pulley, it may have both ends attached to the standard fixed on the grip of the holder—thus causing the drum to rotate automatically with the rise and fall of the holder.

As another alternative, it is proposed, for the purpose of winding up the slack of the metallic tube, to use a steel spring, which in effect would produce the same result as that obtained by the wire rope.

Instead of the flexible tube entering the cup, the tube may be connected to a pipe attached to the grip of the holder, and encircling or partly encircling it; and from this the steam or water may be conveyed to the cup by short pipes or otherwise at any points.

Carburetted Water-Gas Apparatus.—The Economical Gas Apparatus Company, Limited, of Suffolk House, Cannon Street, E.C., and L. L. Merrifield, of Franklin, Mass., U.S.A. No. 15,659; Aug. 20, 1895.

The claims for this invention are: 1. The construction and arrangement of retorts above the water-gas generators, in such manner that the coal gas evolved from soft coal supplied to a retort becomes mixed with the water gas from the generator below the same, while the coke produced in the retort passes down into the generator. 2. The general arrangement of connections between the generators, retorts, and superheaters, whereby various "runs" can be effected. 3. The placing of valves between the fixing chambers and the corresponding oil-heaters, whereby communication for the fixed gas between either of the fixing chambers and the corresponding oil-heater can be shut off when required for particular runs.



The apparatus comprises, as its main parts, two generators A^1 A^2; two retorts B^1 B^2, built upon the top of the two generators respectively; two superheaters C^1 C^2 in connection with the two generators; two fixing chambers D^1 D^2 connected with the two superheaters; two valve-boxes E^1 E^2; two oil-heaters F^1 F^2; two scrubbers G^1 G^2; and two condensers H^1 H^2—the apparatus is, in fact, a double apparatus, each half comprising a generator, retort, superheater, fixing chamber, valve-box, oil-heater, scrubber, and condenser. Each generator is provided with the usual grate to support the fuel, an air-blast pipe, and a steam-pipe at its lower part, a gas-conduit J, fitted with a valve K, leading from its lower part to the corresponding superheater, an ash-door L, stoking-holes M above the grate, and other stoking-holes M at the upper part of the generator—all these devices being of the kind known in connection with generators for the manufacture of carburetted water gas. There is a conduit N, fitted with a valve P, between the two generators at their lower parts. The retort built above each generator is in free communication therewith, and has an opening at the top fitted with a feed-hopper Q. This hopper has a cover at the top, and is fitted at the bottom with a valve worked by means of a lever R. Between the retort and the surrounding brickwork is a space S, forming a communication between the top of the generator and a conduit T leading to a flue U, which communicates with the corresponding superheater. The conduit T is fitted with a valve V. The two retorts are connected together by a conduit W, fitted with a valve X. There are one or more air-inlets to the space between the retort and the surrounding brickwork, and a steam-inlet at the upper part of the retort. The superheaters, fixing chambers, oil-heaters, scrubbers, and condensers are of the ordinary construction; a pipe from each oil-heater being arranged to deliver heated oil between the corresponding superheater and fixing chamber. Between each fixing chamber and the oil-heater, through which the fixed gas passes on its way to the corresponding scrubber, a seal-valve Y is arranged in a liquid seal-box, through which the gas has to pass—that is to say, in the valve-box E^1 or E^2. A pipe leading from the upper part of the fixing chamber has its lower end immersed in the liquid; while the upper open end of the oil-heater (see the valve-box E^1) is above the liquid level. In this way, the gas that flows from the upper part of the fixing chamber must pass through the liquid. It is to the lower end of this pipe that the seal-valve Y is fitted, for the purpose of shutting off communication at this part when required for particular "runs." At the top of each fixing chamber is a stack-valve Z as usual.

The mode of operating the apparatus (either with the two generators together or with either of them singly) is: Firstly, in order to "blow up" both sets of apparatus, both stack-valves Z are opened. The seal-valves Y may be either opened or closed, or one may be opened and the other closed. The valve X between the two retorts is closed; the valve P between the lower parts of the two generators is closed; the valves K between the lower parts of the generators and the superheaters are closed; and the valves V between the tops of the generators and the flues leading to the superheaters are open. Air being admitted to the lower part of each generator, the flow is up through the generator; then through the space S outside the retort; then through the conduit T, leading to the flue U that communicates with the superheater—any gases evolved from the fuel in the retort passing to the bottom of the retort and mixing with the gases from the generator. The gases pass from the superheater to the fixing chamber, and then out through the stack-valve Z.

The carbon evolved from the fuel in the generator mixes with the air, and is converted into carbonic oxide, mixing with the gases from the retort. Air being admitted to the spaces outside the retort, partial combustion takes place (and the retort is thereby heated); the carbonic oxide and other gases passing into the bottom of the superheater. Here more air is admitted; and a percentage of the carbonic oxide is converted into carbonic acid; the heat evolved heating up the checker-bricks in the superheater. The unconsumed gases, and the products of combustion of the consumed gases, pass up to the fixing chamber where more air is admitted; and the rest of the carbonic oxide is converted into carbonic acid—the heat evolved heating up the checker-bricks in the fixing chamber. The resultant gases pass out through the stack-valve Z.

Both sets of apparatus having been heated up, the following is one way of running the two generators together: Close both stack-valves Z; open the seal-valve in the box E^1; close the seal-valve in the box E^2; open communication between the superheater C^1 and the top of the generator A^1; open communication between the lower parts of the two generators, and between the superheater C^2 and the top of the generator A^2; close communication between the lower part of the generator A^1 and the superheater C^1, and between the lower part of the generator A^2 and the superheater C^2; close communication between the two retorts; and admit steam to the upper part of the fixing chamber D^2. The run then will be down the fixing chamber D^2 and superheater C^2; then up to the top of the generator A^2; down through this generator; across to the bottom of the generator A^1; up this

generator; then to the superheater C^1; and to the corresponding fixing chamber D^1, valve-box E^1, oil-heater F^1, scrubber G^1, and condenser H^1. This run can be reversed by opening the seal-valve in the box E^2; closing the seal-valve in the box E^1; and admitting steam to the upper part of the fixing chamber D^1—the other communications being as before.

APPLICATIONS FOR LETTERS PATENT.

15,989.—Hawkyard, J., and Braddock, J., "Gas-meters." July 20.
16,027.—Knotts, A. W., "Illuminating gases." July 20.
16,031.—Levin, S., "Incandescent gas-burners." July 20.
16,082.—Lea, J. W., and Perrins, J. H., "Fittings in incandescent street-lamps and the like." July 21.
16,146.—Wanklyn, J. A., and Cooper, W. J., "Manufacture of cyanides." July 21.
16,157.—Taylor, N. B., and Dias, J. C., "Coke-ovens." July 21.
16,178.—Bush, R. A., "Preventing the bursting of water-pipes by the formation of ice within them." July 21.
16,185.—Hill, H. F., "Gas and other engines." July 22.
16,186.—Kogan, M., "Incandescent gas mantle protector." July 22.
16,244.—Hawes, M. H., and Cannell-Bunn, P., "Mantles for gas and other burners." July 22.
16,251.—Strickland, G., "Gas or oil motor cars." July 22.
16,255.—Bullier, L. M., "Carbides of the earth-metals and alkali-earth metals." July 22.
16,256-7.—Bullier, L. M., "Electric furnaces." July 22.
16,277.—Pratis, L. V., and Marengo, P., "Production of pure hydrogen gas and application of hydrogen to the obtainment of light, heat, and power." July 22.
16,286.—Sawyer, W., "Coin-freed apparatus." July 22.
16,345.—Haddan, R., "Production of acetylene gas." A communication from A. Boter y Carreras. July 23.
16,366.—Blakey, G. G. and R. O., "Gas and other explosive engines. July 23.
16,385.—Bautz, A. E., and Rother, H., "Gas-ovens." July 24.
16,392.—The Manchester Oxygen (Brin's Patent) Company, Limited, and Jackson, W. M., "Applianees for the inhalation of oxygen." July 24.
16,397.—Harris, W., and Lewis, E. A., "Gas stands for the heating of smoothing-irons for laundry and other purposes." July 24.
16,432.—Schemidt, A., "Production and purification of acetylene gas, and portable lighting apparatus for burning such gas." July 24.
16,450.—Lake, H. H., "Devices for automatically lighting gas." A communication from W. Böhm and M. Sternberg. July 24.
16,478.—Dadley, B. B., "Constant service water supply." July 25.
16,483.—Shanks, J. S. D., and M'Cormac, J., "Water and other taps." July 25.
16,554.—Birley, E. H., "Gas, hydrocarbon, and similar engines." July 27.
16,627.—Zimmerling, E., "Incandescence gas-lamps." July 27.
16,644.—Boardman, F. R., "Attaching metal contacts in electrically controlled and other gas-burners." July 28.
16,660.—Bennett, T. J., and Thomas, W. F., "Gas, oil, and spirit engines." July 28.
16,667.—Fenby, E. B., "Gas, oil, and the like engines." July 28.
16,668.—Fenby, E. B., "Cooling arrangements for the cylinders of gas and the like engines." July 28.
16,692.—Wise, W. L., "Manufacture of gas." A communication from E. Thomson. July 28.
16,708.—Hunt, G. G., "Regulating apparatus for gas motor engines." July 28.
16,721.—Lanchester, F. W., "Gas and oil motor engines." July 28.
16,728.—Boult, A. J., "Production of acetylene gas." A communication from F. Alexandre. July 28.
16,735.—Marcus, S., "Burners for gasifying and burning hydrocarbons, chiefly designed for the production of light by incandescence." July 28.
16,771.—Cooper, T., Thomas J., and Still, W. M., "Gas lamps and burners." July 29.
16,832.—Sugg, W. T., Wright, E. S., and Mattock, W. G. H., "Gas-burners." July 29.
16,843.—Pictet, R. P., "Purification of acetylene." July 29.
16,844.—Pictet, R. P., "Manufacture of acetylene." July 29.
16,847.—Woog, P., "Acetylene generators and lamps." July 29.
16,865.—Miles, E. B., "Automatically lighting and extinguishing street and other gas-lamps, including the incandescent and other gas contrivances, at any time desired." July 30.
16,871.—Bradley, P. B., "Conveyor and bucket apparatus for moving coal, grain, or other matters." July 30.
16,891.—Goulson, J., "Coin-freed gas-meter apparatus." July 30.
16,930.—Smith, G. G., "Gas cooking-stove or grill." July 30.
16,966.—Nicholls, W., "Incandescence bodies for illuminating purposes." July 30.
16,964.—Strache, H., "Removing gaseous iron compounds from water gas." July 31.
16,986.—Bradford, W. L., "Heating flat or other irons by gas, and irons for use in combination therewith." July 31.
17,038.—Fitz Gibbon, L. T., "Generating and storing acetylene gas." July 31.
17,044.—Edwards, W., "Lighting and extinguishing gas-jets by means of an electric current." July 31.
17,066.—Birnbaum, T., "Burning illuminating gas." Aug. 1.
17,130.—Bemelmans, L., "Facilitating the burning of poor coal and the like, chiefly applicable for use in gas producers." Aug. 1.
17,134.—Allemano, G., and La Maison Frères Stemmer, "Generating and storing acetylene gas, and utilizing the same for illuminating and other purposes." Aug. 1.

New Reservoir for Castleton.—A new reservoir for the Castleton Water Company has been completed by Messrs. Etheridge and Clark; its capacity being 380,000 gallons. The Company's storage is now adequate for a larger population than is included in the district.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Testing of London Gas.

Sir,—I regret having again to trouble you with a further reply to Mr. Dibdin; but only urgent necessity shall prevent its being the last.

Mr. Dibdin's letters have certainly not removed from my mind the impression of unfairness to which I gave utterance in my first letter, because he has imported into my words meanings they were never intended to, and do not, bear. In his last, he says: "I do not think I have laid myself open to the charge of having suggested to an examiner that 'he should do his best for his employers,' and 'make the quality as low as he can.' When Mr. Livesey re-reads these words, I think he will regret having written them. Had I ever inculcated such an abominable thing, I should be unfit for the position I am proud to hold." If Mr. Dibdin will re-read what I said, he will find no such charge was made. I said: "Occasionally there has been a tester who seems to have considered it to be his duty, from his point of view, to do his best for his employers, and to make the quality as low as he can." I said further that, out of probably fifty testers, in only two cases had "shadowing" been necessary. I meant what I said—neither more nor less; and those words contain no charge or insinuation against Mr. Dibdin.

The point of the matter, however, is: What is the intention of Parliament, or what is the meaning of the testing clauses in all Gas Acts? In dealing with this point, Mr. Dibdin has confused the question, but certainly has not proved that, when Parliament prescribes (say) 16 candles at certain specified testing-places, 16 candles at the consumers' burners is intended. It was made quite clear to Parliament in 1860, and probably earlier, that gas loses appreciably in travelling from the works to the consumers; and with this knowledge, the positions of the testing-places have been fixed. When an intermediate position is prescribed, it is in order that a portion of the loss shall be borne by the manufacturer, leaving the remainder to be sustained by the consumer. When testing at the works is specified, the consumer bears it all; but this is allowed for in the number of candles prescribed—say, 15 at the works takes the place of 14 a mile away, or in about that proportion. Consequently, the consumer loses nothing it was intended he should have; the loss referred to being thus only apparent.

Mr. Dibdin may combat this as strenuously as he pleases; but, before he can succeed, he must upset the Acts of Parliament, for which the consumers would not thank him.

Aug. 6, 1896. George Livesey.

The Estimation of Nitrogen in Coal Gas.

Sir,—I trust that, notwithstanding the length which the correspondence on the above subject has already reached, you will allow me space to point out that there is a sufficiently wide difference in the views which Mr. Wright now expresses with regard to coal gas analyses having high nitrogen percentages, and those given in the discussion of Mr. Hunt's paper "Notes on Residuals," to warrant my having raised objection. That such analyses are not representative of coal gas manufacture is a secondary point.

With regard to analyses showing an absence of nitrogen, there still remains a difference of opinion. Mr. Wright objects that several investigators have been of opinion that that portion of the nitrogen of a coal which they were unable to find in the bye-products may have been in the gas; and as a set-off to this, I have pointed out that other investigators have satisfactorily accounted for the whole of the nitrogen of the coal in its bye-products—the gas receiving none. Mr. Wright appears to think that I should have corroborated my analyses, presumably by similar investigation. I believe, however, that such work could neither credit nor discredit them; sharing as I do the opinion expressed by Mr. Wright when commenting on work of this character (*vide* "Thorpe's Dictionary," p. 185, last paragraph)—an opinion which I expect he still holds, notwithstanding his recent letters.

It appears to me to be an unwarrantable step to credit the gas with the experimental error and loss of nitrogen occurring in such investigations, and also, having regard to diffusion of gases, to assume that the nitrogen found in coal gas made in clay retorts (unless they are worked under pressure) is derived from the coal itself. I therefore retain confidence in my analyses of gas showing an absence of nitrogen.

I fail to see the relevancy of the last paragraph of Mr. Wright's letter. It would appear to have been forgotten that the nitrogen of a coal is found to a much greater extent in the coke and tar than in the ammonia and cyanogen; and I may add that I have long known that the highest yield of ammonia is not obtained at the highest temperature, and have never expressed myself otherwise.

Adderley Street Gas-Works, Birmingham, July 31, 1896. E. Llewellyn Pryce.

Burns a Molehill?

Sir,—It is unfortunately too true that the name and fame of William Murdoch, the discoverer of coal gas, are known to, and appreciated by, far too few Scotsmen. But when your Scottish Correspondent says that "the work . . . of Murdoch is a mountain, but that of Burns is a molehill," I, on behalf of thousands of Scotsmen, must emphatically protest against the "molehill" theory. Is it philosophical in your correspondent to build Murdoch up by pulling Burns down? Surely the effulgent light of Scotland's darling poet need not be dimmed in order that the brilliance of Murdoch's star may come into ken. As well may the engineer who has an intimate knowledge of railway construction declare: "Your Shakespeare is too highly lauded; what is he beside Stephenson?" If I might alter Tennyson for the nonce, I should say—

"Let Murdoch grow from more to more,
But more of Burns within us dwell."

Well, Burns never constructed a piece of ingenious mechanism that conferred "solid and substantial" benefit upon mankind. But what

then? Must all benefits be of the material kind? So thinks the utilitarian. Why is it that Scots glory in Burns? Because he re-kindled the fire of Scottish patriotism, dignified labour, sang the joys and sorrows of his native land, and, in heart-stirring tones, called upon his fellows to quit themselves as men, and be strong. Creatures, cringing, servile animals, in the form of men, but having boundless possibilities, are rife enough; and there is work for ten thousand such as Burns to stir the lethargic souls. Here, in the South of England, there is a very strong tendency to make men (without wealth) into pliable beings, and as much alike as peas in a pod. In country towns and districts, individuality has to be crushed. The essential work of poets of the Burns order is to fortify thinking men with an energy that will help them to resist being turned into mere jelly to be run into moulds and forms prepared by the disciples of mediocrity, children of Mother Grundy. Burns is dead; long live Burns!

Gas-Works, Newbury, July 31, 1896. ROBERT MACKENZIE COUPER.

Low Rate of Interest and the Price of Commodities.

SIR,—Please allow me a few lines in reply to Mr. David Spence's letter in your last issue.

First I should like to say that I was not "puzzled" that the rate of interest had remained so low. On the contrary, I very confidently pointed out what I thought was the chief cause—viz., the investment of money being confined to home securities and home industries.

As regards the index numbers, I was speaking of the last two years. Of course, we all know that, compared with 1867-77, there is a considerable fall, but for the last two years, they have "improved rather than otherwise;" and this very moderate and qualified statement is approximately correct, especially if you except the month of June last, which was affected by exceptional causes due to large speculations in sugar and coffee. But one cannot weary a public meeting with too exact details, or speak in any but general terms.

Let me say, in conclusion, that one cannot but recognize the veiled Bimetallist in Mr. Spence's remark about the "continuous fall in prices," which is another question altogether. But, since our trade figures are, notwithstanding this fall, almost as large as the big year of 1890, it cannot have affected the value of money; and this was the position upon which I had to remark.

London, July 31, 1896. JOHN GREEN.

Mr. Damon and the Evans Photometer.—Mr. W. Sugg asks us to mention that, owing to the large amount of additional work thrown upon him by the recent fire on his premises, he has not been able to reply to Mr. Damon's letter (*ante*, p. 221), but will do so in our next.

The Water Supply of Torpoint.—An inquiry was recently held at Torpoint by Colonel C. H. Luard, R.E., respecting an application by the St. Germans District Council for the sanction of the Local Government Board to a loan of £1000 for works of water supply in the parish of Antony. A loan of £6000 was raised some years ago for the purpose of constructing a reservoir and other works of water supply for Torpoint. Since the reservoir was completed, it has given a great deal of trouble owing to leakage, and a further sum of £765 has been borrowed to repair it. The present loan is for the same purpose.

New Joint-Stock Companies.—The Charlbury Water-Works Company, Limited, has been registered with a capital of £750, in £1 shares, to supply water at Charlbury, Oxfordshire; and the Pietersburg (Transvaal) Estate and Water-Works Company, Limited, with a capital of £5000, in £1 shares, with the object indicated by the title. The Yorkshire Petroleum Oil Company, Limited, with a capital of £2000, in £1 shares, has been registered for the purpose indicated by the title. The Instantaneous Gas Lighting and Extinguishing Company, Limited, with a capital of £80,000, in £1 shares, is to adopt and carry into effect an agreement, expressed to be made between the Midland Purchase Syndicate, Limited, of the first part, J. T. Armstrong of the second part, and the Company of the third part, and generally to buy, sell, let on hire, and deal in all kinds of gas-fittings, burners, gaseliers, stoves, engines, and other apparatus and conveniences in connection with the manufacture and consumption of gas, and to carry on business as gas engineers, electricians, gasfitters, suppliers of electricity, &c. The Gloria Electrolytic Incandescent Light Company, Limited, with a capital of £20,000, in £1 shares, is to acquire and turn to account "any patents relating to improvements in lighting by gas." Thomas Glover and Co., Limited, with a capital of £100,000, in £10 shares, has been registered as a private company for the purpose set forth in the "JOURNAL" for the 21st ult. The Standard Oil Company of Galicia, Limited, with a capital of £1,000,000, in £10 shares, has been formed primarily to adopt and carry into effect an agreement, made between the Petroleum Proprietary, Limited, of the one part, and Henry Thomas M'Auliffe, on behalf of the Company, of the other part; and generally to prospect, explore, and test ground supposed to contain naphtha, petroleum, and other oils, and to sink wells for that purpose. The Smokeless Briquette Syndicate, Limited, with a capital of £75,000, in £5 shares, will acquire patent rights for the utilization of coal or coal dust; and carry on the business of gas makers, coke manufacturers, tar merchants, &c. The Calcium Carbide Company, Limited, has been established to enter into an agreement with Mr. J. C. Bayley, and to carry on business as acetylene gas generators, calcium carbide manufacturers, &c. The capital is £5000, in £50 shares; and the offices are at Bournemouth. The British Gas Traction Company, Limited, with a capital of £250,000, in £5 shares, is "to acquire, by purchase or otherwise, any patents, patent rights, *brevets d'invention*, licences, concessions, and the like, conferring an exclusive or non-exclusive or limited right to use any secret or other information as to any invention which may seem to the Company capable of being profitably dealt with; with a view to the foregoing objects, to adopt and carry into effect an agreement expressed to be made between the Gas Traction Company, Limited, of the one part and the Company of the other part."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Friday, Aug. 7.

The following Bills received the Royal Assent to-day: Aldershot Gas and Water Bill, Bournemouth Gas and Water Bill, Drogheda Corporation Bill, Eastbourne Water Bill, Edinburgh Extension Bill, Kilmarnock Corporation Water Bill, New River Bill, Redheugh Bridge Bill, Sheffield Corporation Water Bill, South Metropolitan Gas Bill, Water Provisional Orders Bill.

HOUSE OF COMMONS.

Friday, Aug. 7.

THE EAST LONDON WATER SUPPLY.

Mr. PICKERSGILL asked the President of the Local Government Board whether his attention had been called to the report of an inquest on a child held at Poplar on the previous Monday, when Dr. Cooper Harrison, the medical witness, attributed the existing prevalence of fatal cases of diarrhœa among children in the East-end of London to the scanty supply of water, and also stated that in his own house the water was not turned on more than one hour a day, and that there was a filthy deposit in the water supplied; and whether, in these circumstances, he would make further representations to the East London Water Company as to the urgent necessity for improving both the quantity and the quality of the water which they were supplying to their customers.

Mr. T. W. RUSSELL: The President has seen the report of the inquest which has appeared in the newspapers, and is aware of the statements of Dr. Harrison which are referred to in the question. As regards the supply of water to Dr. Harrison's house, the President is informed by the East London Company that it was from seven to nine o'clock in the morning, and from one to three o'clock in the afternoon. This supply was for four hours; and he is unable to give any explanation of the supply being for less than six hours. With regard to the quality of the water, the Company have forwarded samples which were yesterday drawn from the communication-pipe supplying Dr. Harrison's house. So far as these are concerned, there is no evidence of any turbidity or other deposit in the water supplied; and the Local Government Board are not aware of any general complaint as to the quality of the water. As regards the prevalence of fatal cases of diarrhœa among young children in the East-end of London, the President understands that the usual autumnal increase of diarrhœa has been somewhat exceptional this year, both in London and in many other towns. There is generally an exceptional increase when excess of temperature is combined with deficient rainfall; but there is no evidence to show that there is any increase in deaths from this cause in East London in consequence of the diminished supply of water in the district. Indeed, the published returns for the last few weeks show that in certain divisions of London and other towns where there has been no deficiency in the water supply the increase in the number of deaths from diarrhœa has been greater than in the East district of the Metropolis. The President has been in constant communication with the East London Water Company; and he has no reason to doubt that they are fully realizing the necessity of giving as large a quantity of water as the circumstances will admit.

The Dublin Corporation Bill, one part of which relates to the charge for water to the outlying authorities, was passed by the Select Committee to whom it was referred, and reported to the House. But a question arose on certain franchise clauses, and the Bill was re-committed. It has since been again reported, read the third time, and passed, and returned to the Upper House. The gas portion of the Bill, it will be remembered, was rejected by the Committee of that House.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Aug. 4.

(*Before Mr. Justice* STIRLING.)

Sunlight Incandescent Gas-Lamp Company and Another v. The Incandescent Gas-Light Company, Limited.

This was a motion for an injunction to restrain the defendants from threatening the customers of the plaintiff Companies, or either of them, or other persons, in respect of the purchase or use of mantles supplied by the Companies or either of them. The second plaintiff Company is the New Incandescent (Sunlight Patent) Gas Lighting Company, Limited.

Mr. GRAHAM HASTINGS, Q.C., Mr. BOUSFIELD, Q.C., Mr. ROGER WALLACE, Q.C., and Mr. JENKINS appeared for the plaintiffs; Mr. MOULTON, Q.C., Mr. TERRELL, Q.C., and Mr. WALTER, for the defendants.

The motion was made in respect of letters sent to two of the plaintiff Companies' customers named Irons and Fowler; and it was contended that these letters were couched in such general terms as to interfere with the plaintiffs' business. Several affidavits had been filed on either side; and, after some discussion, the motion stood over in order that the witnesses might be cross-examined. It was stated that every effort would be made to conclude the cross-examination and dispose of the motion before the Long Vacation.

His LORDSHIP intimated that, if this were not done, he should give leave to the plaintiffs to bring on the motion before the Vacation Judge.

Friday, Aug. 7.

The matter came again before his Lordship to-day, when Mr. Moulton stated that both sides felt it would be practically impossible to have the cross-examination before the Long Vacation, as it would take too long. As the result of negotiations which had taken place between the parties, it was suggested by Mr. Graham Hastings, Q.C., representing the plaintiff Company, that the defendants should give an undertaking to abstain from issuing notices to customers of the Sunlight Company in such terms as to induce the belief that they were directed against Sunlight mantles. The defendants said they never intended to do this; and therefore it would be only reasonable that they should give the undertaking in the above terms. But there were two conditions that they would insist upon—first, that the plaintiffs should not make any use of the undertaking by advertising it (this was agreed to by the plaintiffs); and, secondly, that it should be entirely without prejudice to the defendants' contention, and that if they agreed to do anything to avoid causing the plaintiffs offence, it must not be taken as an admission that the defendants were wrong before they took these precautions. His Lordship sanctioned the cross-examination standing over, as desired; the undertaking to be given until the hearing of the motion.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, Aug. 5.

(*Before the* LORD CHIEF JUSTICE.)

Goodson v. Sunbury Gas Company, Limited—The Reinstatement of Roads.

This was an action tried by his Lordship and a special jury on the 2nd ult. (see *ante*, p. 28), when the plaintiff was awarded £250 damages. A legal point was raised as to the defendants' liability; and at the close of the arguments, judgment was reserved. This was given to-day.

His LORDSHIP said the plaintiff sought to recover damages for injuries sustained by him in consequence of being thrown out of a vehicle in which he was driving with others. The defendants had been laying down gas-mains, and had dug a trench at the side of the road, which they filled up so carelessly that the wheel of the vehicle sank in, and the vehicle was overturned. The jury found that the Company had failed to reinstate the road; that they had failed to make good the road; that they were guilty of negligence in the original filling up of the road; that the accident was caused by the defendants neglecting to make good the road; that the state of the road over the trench and its condition constituted a nuisance in the sense that there was danger to those lawfully using the road; that the nuisance was caused by the defendant Company; and they assessed the damages at £250. The defendants contended they were not liable, because under section 11 of the Gas-Works Clauses Act, 1847, a penalty was imposed for breaches of statutory duties. In his opinion, however, this section dealt principally, if not exclusively, with cases of delay in carrying out and completing the work which the Act enjoined; and he thought it was not applicable to cases like the present, where the work had been done and turned out to have been improperly and carelessly executed from the beginning. Even assuming it to bear the interpretation sought to be put upon it by the defendants, he did not think they could escape liability in the present action. All the instances cited to him as showing that the imposition of a penalty for breach of a statutory duty did away with the right to maintain an action for damages, were cases where there was a breach merely of a statutory duty. Each case must be judged by itself; and in the present instance it was not, to his mind, necessary to consider whether it was intended by the Gas-Works Clauses Act to take away a right of action in respect of breaches merely of statutory duties for which penalties were imposed by the Act. This he was not to decide now, because in this case he had a great deal more than a breach of a duty imposed by the Gas-Works Clauses Act. The jury having found that the defendants left the road in a condition which constituted a public nuisance, they would be liable to an indictment and for the consequences in which they were held liable. Finally, it was enacted that nothing in the Act or the Special Act should prevent the undertakers being liable to an indictment for nuisance or for any other legal proceedings for which they might be liable in making gas. For the reasons he had given, he thought the defendants might, apart from that, be made liable. Judgment would therefore be given for the amount of the verdict for the plaintiff.

Mr. COCK, Q.C., on behalf of the defendants, asked for a stay of execution pending an appeal. It was a very important case, since thirteen actions were being brought.

His LORDSHIP ordered the defendants to pay the plaintiff £30, as a condition of staying execution with a view to appeal.

Counsel for the plaintiff asked that this payment might be absolute.

His LORDSHIP: No; if the defendants succeed in upsetting this judgment, and if they can get the £30 back, they may do so.

Falmouth Corporation Schemes.—A comprehensive scheme of town improvement was laid before the Falmouth Town Council last Saturday week. It is proposed to purchase the gas and water works at a cost of about £30,000, spend £2500 on pavements, purchase the market from Lord Kimberley for £3000, and extend the pier.

The Gravesend Corporation and the Water-Works.—At a recent meeting of the Gravesend Town Council, the Finance Committee reported on the question of the acquisition by the Corporation of the undertaking of the Gravesend and Milton Water-Works Company, and recommended that, in consequence of the repeated refusals of the Company to negotiate for the sale of their works, the necessary steps should be taken for applying in the next session of Parliament for compulsory powers of purchase, in the event of an agreement not being arranged. The Committee had received a report from Mr. W. A. Valon, of Ramsgate, on the subject, and recommended the Council to offer £120,000 for the property. After some discussion, the question was referred to the whole Council in Committee.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Friday, at the Chief Office, Horseferry Road, Westminster—Colonel W. T. MAKINS (the Governor) in the chair.

The SECRETARY and GENERAL MANAGER (Mr. J. W. Field) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ending June 30, given in the "JOURNAL" last week, was taken as read.

The GOVERNOR, in moving the adoption of the report and accounts, reminded the proprietors that at their meeting six months ago he stated that the dominant factor in the Company's history was progress all along the line; and he could now repeat this observation. It was a matter for great congratulation that the sale of gas, which advanced so considerably in the June half of 1895, had, contrary to the opinion which he expressed in February, continued to increase, and this although a much higher average temperature had prevailed in the past half year than in the corresponding period of 1895. The quantity of gas sent out during the past six months had actually been in excess of that sold in the first half of 1895, when the sales were largely augmented in consequence of the severe and prolonged frost from which everybody suffered in the early months of that half year. When the figures for the past six months—corrected, of course, for leap year by one extra day—were compared with those for the June half of 1894, it would be seen that there had been a very considerable increase in the two years in the sale of gas both for public lights and for private consumers—being equal to just over 6 per cent. The augmentation in regard to the private consumers was explained to the extent of 3½ per cent. by the introduction of the system of automatic meter supplies; and the other 2½ per cent. was attributable to the general increase which had taken place in private lighting, the result of the continued favour with which heating and cooking by gas were viewed by the public. In connection with this question of the additional sales of gas, he had no doubt he should be expected to refer to the complaints which had been made with respect to the increase in the gas bills—the subject, that was to say, of the registration of the meters. It was a familiar complaint, which had been repeatedly made by consumers, that they could not understand how it was that the less gas they used the more they seemed to have to pay for it. Now, in connection with this matter, he had only to say that no one was more interested than the gas company in having perfectly reliable meters; and everything that could be done was done by their Company to produce this result. Only two days previously he inspected their new meter-testing station at Fulham, which they had erected and equipped in the past eighteen months at a cost of over £20,000; and anything more perfect for dealing with the testing of meters he did not think it would be possible to create. He only wished any discontented consumer or any shareholder would apply to the Secretary for an order to view these works, as then he would see for himself exactly what was done. He might say, with reference to the testing of their meters, that for some years past a very large number had gone through their hands. He would, however, take only the last five years. In that period, of all the meters which had passed through their hands for testing, 50 per cent. were found to be absolutely correct; 27 per cent. were found to be registering fast (that was to say, more or less against the consumer); 14 per cent. were found to be registering slow, or against the Company; 7 per cent. passed gas without registering it, which, of course, was entirely against the Company; and 2 per cent. were found to be out of working order, and did not register at all, or passed the gas. The excess number of fast meters over that of slow meters was, of course, against the consumer. But this discrepancy was more than adjusted when they came to compare the figures; for whereas the meters found registering against the Company were, on an average, 9 per cent. slow, those registering against the consumer were only, on an average, 4 per cent. fast, while those, of course, which passed the gas without registering at all would materially alter the balance in favour of the consumer. He was quite sure that these figures must demonstrate fully the groundlessness of the complaint made with respect to the meters. But over and above the Company's testing, any consumer who had any cause of complaint had by law, under the Sale of Gas Act, a right to call upon the London County Council to test his meter for him. If it was found incorrect in favour of the Company, the latter always made an abatement; whereas if it was found to be incorrect against them, they received nothing at all. There was another right which the consumers had, if they chose to exercise it. They could have their own meters, which would be under their own control, although the Company would have power to test such meters in their own interests. The consumers could, however, go to any maker they might think fit, and buy their meters, which would then, of course, be their own property. With respect to the meters which the Company purchased, extra precautions were taken by them to get them of the best possible quality; and they insisted on a covenant in the agreement with the meter makers by which the latter guaranteed them for five years. The Company had very seldom found it necessary to call upon the makers to pay anything under this covenant. The unsatisfactory feature in their accounts for the past half year was that of coke. In common with all other gas companies, they had suffered from the serious depreciation in the market value of coke—partly, he supposed, the result of a winter not only without frost, but of an abnormally high temperature; and partly, it might be, owing to the substitution of the automatic gas supply for coke among the working classes. This was rather an awkward feature, as if they were supplying gas to compete with their coke it would be putting a profit on one side of the ledger against the other. This, however, could not be the case to any great extent; and it was only one of the causes which might operate in reducing the demand for coke. The Company especially felt the loss in coke, partly through the incident in connection with the cement trade, to which those who attended the meeting last year would be

aware he then alluded, and partly because in the corresponding half of the previous year their receipts were excessively good from coke, as they then obtained a very fair price for it. In considering this question of the depreciation of the local price of coke, their Company, although generally under great disadvantages by reason of the position of their principal works, had certainly one advantage over their neighbours, as they were peculiarly well situated at Beckton for the export trade; and, as a matter of fact, they had arranged to avail themselves of this system to the extent of about 200,000 tons, which they had been able to sell for delivery to foreign buyers during the next twelve months, at prices in excess—and considerably in excess, in some cases—of what they had been able to obtain from the local trade in England. They were bound, in a Company like theirs, to look for every outlet for their products—not only for their coke, but for their other residuals as well. The question of the London coke had been rather a burning one for some time past; and he was glad to say that between now and the time of making the next contracts the London Companies might have an opportunity of conferring together on the subject—indeed, he believed that this conference was already arranged—in order to get the best possible return they could for the local coke. The delay in completing their arrangements with the foreign buyers, and the general lateness of the exporting season, had had the effect of slightly increasing their stock of coke on hand; but he had very little doubt as to the ultimate success of this new development of their coke trade as a means of dealing with any excess. He might state that, in dealing with the stock for the purposes of the balance-sheet, the question of market value and of deterioration in quality had been fully discounted—in his opinion, more than fully discounted—so that whatever loss was likely to be made, they had already paid for. With respect to the other residuals, the returns for tar and tar products had been very satisfactory. The price yielded per gallon of tar was just over 2d.; and the immediate outlook was, he thought, reassuring. The returns for ammoniacal liquor and its products must also, he thought, under the circumstances of the markets for sulphate and nitrate of soda, be considered anything but unfavourable; but until there was a material improvement in the agricultural conditions of the country, and until the farmers appreciated more correctly the nitrogenous value of sulphate of ammonia, they could not expect to see a return of the old prices which they saw some time ago under this heading. There was this comfort in regard to that point—that there had been an unusually good and early harvest; and he hoped that the farmers would be rather inclined to spend some of the profit which so seldom came to them in the purchase of sulphate for their next crops. On the expenditure side of the revenue account, they found several interesting items, one of which, and the most important, was the cost of coals. It was very satisfactory to have to report that the net price paid for coals, including the cost of enrichment, had again been the lowest on record; having been 11s. 0¼d. per ton, or 1s. 2¼d. per ton lower than in the corresponding half of last year, and 1¼d. per ton below the rate of the last December half year. An appreciable portion of this benefit, they would be glad to learn—he, at any rate, was very glad to say it—arose from the result of the labour-saving appliances for handling the coal which, during the last two or three years, they had put into their works at Beckton and elsewhere; and on the top of it all, he was happy to inform them that they had bought their coal for the current year at prices even a trifle lower than those paid during the past half year. The item of purification was not quite satisfactory. Some time ago, they were advised—and they took the advice—to give a trial to the new system of purification by means of Weldon Mud. They had hoped that this would reduce the charge for purification. The result, however, had been rather the other way, he was afraid; but the whole question was now being investigated, so he was not in a position to say definitely that day to what extent, if at all, the Weldon Mud system was to blame. The charges for wear and tear were normal. They would remember that a year ago he accounted for the reduction in the amount of wear and tear for the half year at that time under review—to some extent, at any rate—by the fact that, owing to the prolonged frost, the ordinary works repairs had been postponed, or somewhat hindered. This year, however, the work was commenced, and had been carried on under very favourable conditions. The distribution charges again called for special notice. There had been an increase in the half-year's expenditure, as compared with June, 1895, of between £8000 and £9000, or of £29,000 as compared with the June half of 1894. The whole of this additional charge had been incurred in connection with the further and continued extension of the automatic meter supplies. As he had on former occasions explained, the introduction of this system was necessarily costly; and it had made very serious demands both upon their revenue and their capital accounts. But up to the present time it had proved to be remunerative. In connection with this, he might mention that the average consumption per meter remained, as he informed the proprietors six months ago, at about 20,000 cubic feet per annum; and he was therefore glad to be able to report that there had been a regular addition to these supplies week by week. The total number up to June last was just over 42,000, as against 11,000 on June 30, 1895; and there were on hand on the 1st ult. about 6500 applications, which they hoped to be able to comply with before the end of the current month. In the spring of this year, owing to the impossibility of obtaining meters in sufficient numbers to enable the Company to complete with anything like promptitude all the supplies on order, they were obliged to suspend receiving additional applications. The fact was that they had been getting into very serious disgrace with the large number of applicants who had entered into contracts for automatic meter supplies which the Company had been unable to complete. The arrangements they had made for the future would, he hoped, prevent any similar disappointment; and he had no doubt that the number of consumers under this system would be again very largely increased before the end of the current year. There had been in this, as in all other new systems, many difficulties to overcome. In the first place, the mechanism of the penny-in-the-slot attachment in some cases had worked very unsatisfactorily, causing both consumers and the Company's officers considerable trouble and annoyance. Again, the money-box had been found to be too great a temptation to members of the "area sneak" fraternity; while in some cases the Directors had had to take proceedings against consumers for wanton damage to the meters and fittings. However, the police had dealt efficiently with the former class, and the Magistrates equally so with both classes. All this had entailed considerable expense in connection with the system, and accounted for some of the additional expenditure under the heads of both distribution and law charges. He wished to say to the consumers generally that, if this system of gas supply was to be a success, and was to be maintained and expanded, they must look to them to co-operate with the Company in preventing any abuse of it, and any injury to the meters in their charge. He next had to refer to that old bugbear rates and taxes, which went on increasing "by leaps and bounds." He had so often, however, alluded to this subject, that he was perfectly sick of it; and he would therefore only mention that there was again a further increase in the amount payable this half year of nearly £8000. Under the heading of "Management," it would be found that there was a large increase in the item of collectors' commission. This addition was entirely attributable to the automatic supply system. He was glad to be able to say that, with respect to the ordinary collectors' commission, the item was not increasing, in consequence of the additional facilities now afforded to the public at the Company's show-rooms at Goswell Road, Kensington High Street, and Kilburn High Road, where arrangements had been made for the daily attendance of cashiers for the receipt of gas accounts from the consumers in these districts. This system had several advantages. One was that it frequently ended in a consumer, when calling at the office for the purpose of paying his account, making himself acquainted with the special advantages of cooking and heating stoves, with the result of his becoming a user and purchaser of them. He wished any shareholder who happened to be passing along Kensington High Street, Kilburn High Road, or Goswell Road would look in and see the premises, as he believed such a visit would be very gratifying, and he would see how the business was carried on. This certainly tended to increase at all these local depôts; and the result realized had more than justified the Directors in establishing them. A very satisfactory feature in the half-year's accounts was the reduction which had been made in the item of bad debts. He supposed this was to be accounted for partly by the improvement in trade. There was an increase in the annuities, resulting from their old-age pension system for the workmen, which he mentioned at the last meeting. The amount paid during the past half year had been £4250. The system worked most satisfactorily. It gave satisfaction to the men, and it created a bond of union between the Company and their employees, which was of great importance to them. He was very glad the proprietors sanctioned the Company embarking on this arrangement; and he believed that it was both good as a matter of duty and also as a matter of prudence and policy. The result, he had no doubt, would justify the establishment of the system. He thought there was only one other item of expenditure to which he must call attention—that was, the interest on temporary loans, which had reached the exceptionally large figure of £5779. As the proprietors were aware, they had been going on for some time past with too small a balance of working capital; and the sum he had mentioned represented the interest they had had to pay on loan capital borrowed from time to time from their bankers for carrying on their business. As the proprietors knew, they were putting out another £150,000 of their "A" stock to tender; and the minimum price at which it was offered—which was fixed some little time ago—was only £307 10s. Since this figure was decided on, however, the price of their stock had risen to between 320 and 325—a fact which must be gratifying to those who had invested in it. He therefore hoped that those who were tendering for the new stock would offer a higher price than £307 10s. All he could say was that, despairing of getting any of the stock at that price himself, he had put in his tender a few pounds above it; and he trusted that the whole of the amount would be taken at a higher figure than that which was originally fixed. The next time they went to the proprietors for capital, he hoped they would be able to ask for loan capital in addition to share capital. This would bring down the charge for capital, and would be a step in the right direction. He usually began his remarks at their meetings by giving them statistics; but on the present occasion he had deferred these till the end. He would, however, with their permission, give them a few of the salient figures, as had been his custom hitherto. They had spent on capital account in the past half year £33,200, as follows: For the new meter-testing station at Fulham, £9000; for extensions at the products works, £12,000; for coal-unloading machinery and other minor matters at Beckton, £5700; for a new gasholder at Nine Elms, £3500; and for new show-rooms at Kilburn, £3000. The other items of expenditure on capital account were mainly in connection with the automatic supplies and the general extension of the distributing system. The expenditure for mains and service-pipes had been £25,000; for meters, £45,000; and for stoves, £14,500. These three sums amounted together to £84,500, and made a total capital expenditure in the half year of £117,700. The actual work done by them as regarded distribution during the half year had been the laying of 2850 new services to ordinary consumers, and 5931 to automatic consumers, or a total of 8781. They had also provided 2706 new meters to ordinary consumers and 13,298 to automatic consumers, or a total of 16,004. They had further provided 3489 new stoves to ordinary consumers and 9154 to automatic consumers, making together 12,643. This raised the numbers respectively as follows: Ordinary consumers, 218,335; and automatic consumers, 42,333—making the total number of stoves supplied by them in their district 260,668. The ordinary consumers' stoves numbered 76,300, and the automatic consumers' stoves 38,189, or a total of 114,489. Those were the distribution statistics for the past half year; and he thought the shareholders would agree with him that they showed a lively state of business. The capital per ton of coal was £5 19s. 10d., against £5 19s. 1d. in June, 1895; and the slight increase of 9d. per ton was quite justifiable in view of the large capital expenditure on automatic meters, only part of which was at present bearing fruit in the shape of increased consumption. The net result was that, in order to pay their statutory dividend of 12¾ per cent. per annum, they had to dip into their undivided balance to the extent of £55,223—leaving £108,897

to be carried forward to the accounts of the current half year. This sum, added to their reserve fund, made a total amount applicable to the payment of dividend of £239,581, which was equal to 3d. per 1000 cubic feet on the Company's annual sale of gas. He thought, therefore, that they had a pretty strong reserve, although they had not got what at one time was described as a "bloated balance." With respect to the future, they would have again in the present half year to take something from their reserve. He hoped it would be a little less, and certainly not more than the sum withdrawn on this occasion. After that their large expenditure on the new appliances he had mentioned would begin to bear fruit fully; and he believed they would then be able to go on without calling upon their reserve to make up the dividend. The only other alternative would be an increase of their price and a reduction of the dividend. He did not in the least expect anything of the kind; but the consumer could only benefit when the Company could supply gas cheaply, and this must depend on the result of their manufacture and their increase. Of course, this indicated that they did not expect to reduce the price of gas, at any rate in the immediate future. Attention had been called—and no doubt many of the shareholders had noticed it—to the fact that they had not on this occasion charged for depreciation of meters and stoves. The reason was that for many years their charge for the maintenance and depreciation of meters and stoves had been materially higher than the corresponding charges of other Companies, both in the Metropolis and elsewhere. This had been the result of the system adopted by the Company of writing off annually a considerable percentage of the original cost of both stoves and meters for depreciation. Upon the adoption of the automatic meter system, it was necessary to make a similar provision in respect of the item of gas-fittings in connection with it; and it appeared to the Directors that, inasmuch as the original cost of meters any stoves had been written down very considerably, it was not necessary to continue this meter and stove depreciation fund in addition to the automatic supply depreciation fund. They therefore decided, for the present at any rate, to suspend the old fund so long as they had to provide annually a considerable sum towards the liquidation of the automatic meter expenditure. The course adopted by the Directors in this matter was on all fours with that of the Chancellor of the Exchequer. It would probably be within the recollection of many who read the Budget speech, that the Chancellor of the Exchequer last April, finding that it would be impossible to meet all charges, including the annual sinking fund for the reduction of the National Debt, without an increase in taxation, decided to suspend the operation of the sinking fund, with a view to avoiding the imposition of a fresh burden on the public. He (the Governor) believed that this policy was just; and he hoped it would meet with the proprietors' approval. There was another question which, no doubt, those who were conversant with gas politics would have noticed—namely, the successful issue of the application to Parliament of the South Metropolitan Gas Company, following the example of other companies, for the splitting up of their stock, and making it bear a lower rate of interest. He said at a former meeting that they were carefully watching the result of this effort; and he heartily congratulated Mr. Livesey on the success which had attended him. He (the Governor) thought it was a very excellent policy; and he sincerely hoped that they might be able themselves to follow the example. In their own case, however, there were certain difficulties which did not exist in that of the South Metropolitan Company, because they had a large quantity of preference stocks. He hoped, however, that these difficulties were not insuperable; that they might be able to weld all the stocks into one common preference stock bearing a moderate rate of interest; and that they would also be able to deal with the open stock on similar lines to those which had been adopted by the South Metropolitan and other companies. He desired to say one word only respecting himself. He apparently seemed to have got into some disgrace by a little aggrandisement of the Company, for having described it as a *quasi* department of the State. He noticed that those who quoted him in this matter always left out the word "*quasi*," and so misquoted him. He did not wish to withdraw any part of his statement; and he maintained that they were a *quasi* department of the State. They were not a private trading company, in the ordinary sense. They could not issue capital or subscribe to new works, or practically do anything, without the supervision of the Government and the Board of Trade. They were also supervised in the working of the concern by the municipal authorities—the London County Council and others; and therefore he thought, when they were so hemmed in with restrictions for the benefit of the consumers, that they might be looked upon as a body who were working not only for the shareholders but also for the consumers, and working in alliance with the State. Therefore he contended that they were more or less a *quasi* department of the State. He, however, assured those who had objected to this remark that he had had no idea of exalting either himself, his colleagues, the officials, or the Company, but merely to describe exactly what the position of the concern was. There was one other matter he desired to refer to which might, perhaps, be interesting to the proprietors, for it proved how very carefully they went into all these things. He had a return showing the percentage increase of their gas sales in 1895, compared with 1894, in various parts of their district; and they presented some very curious results. In some of the places where they would expect the increase to be great, it was very moderate; and in other places where they would expect it to be moderate, it was very large. He would mention a few cases as typical of the whole. At East Willesden, which was a growing district, they had had the comparatively large increase of 12 per cent.; and in Willesden itself, the increase was 10 per cent. In West Fulham, the increase was 9·8 per cent.; in Battersea, only 5 per cent.; and in Lambeth, only 1 per cent. One item in these comparisons which had amused him more than any other was that in the City, where the City of London Electric Lighting Company were so active, they had had an increase in the parish of Walbrook of 6·2 per cent., and in Coleman Street of 7 per cent. He observed, however, a side note, suggesting that this was due probably to the "mining boom," because stockbrokers had had to be at their offices so late that they had consumed a greater amount of gas. He saw present Mr. Rokeby Price, who might be able, perhaps, to inform them how long they might be able to depend on this increase. He hoped it would continue, both for the sake of their Company and those who were interested in South Africa.

The Deputy-Governor (Mr. H. C. Ward) seconded the motion.

Mr. W. Griffith said he had felt a little anxiety respecting one remark of the Governor—namely, that he did not think it would be possible to lower the price of gas in the immediate future. Would the Governor inform them what he meant by "the immediate future," because the value of their stock depended on the sliding-scale, and the sliding-scale had to do with the reduction of price. As rather a high figure was asked for the new issue of stock referred to, one had to calculate what the price of gas would be in the coming time as well as in the immediate future. He hoped the Governor would be able to assure them of the maintenance of the dividend at 12¾ per cent., and also that the "immediate future" within which their price was not to be lowered was not very distant.

Mr. Cumming inquired whether, if the price of gas were increased, the 40,000 or 50,000 slot meters would have to be altered so as to supply a less quantity.

A Shareholder referred to a banquet which was recently given by another Company, and which was presided over by a gentleman who was spoken of in the Press as the Distributing Engineer of this Company, and as presiding over the banquet in that capacity. He desired to inquire whether it was with the sanction of the Directors that the gentleman in question took the chair at the banquet.

The Governor, in reply, stated that the Company referred to by the last speaker must be very well known as the Lighting Corporation, who had bought Bedford Chapel, Bloomsbury, and were converting it into a large gas lighting emporium. The moving spirit of the Corporation was Mr. Pond, who was doing a great work for gas lighting. Some time ago, this gentleman asked him (the Governor) to preside at a banquet to inaugurate one of his installations. He thought it would be better for him not to do so; but if he had, he should not have done so as Governor of this Company. Mr. Pond asked him if he could suggest anyone else. He replied that the man who, so far as he was aware, knew most about distributing work was this Company's Engineer; that he might invite that gentleman as a guest; and that the Company would not object to the latter's going in his private capacity. The system of gas lighting and ventilation which Mr. Pond and his Company were introducing might have far-reaching results; and already in some public buildings the electric light had been discontinued, and this system of lighting and ventilation had been substituted for it. Clarence House, the Duke of Saxe-Coburg's London residence, had been to a large extent fitted up by Mr. Pond; and His Royal Highness had told him (the speaker) that he was very well satisfied with the result, and had asked him to go and see the installation at Bloomsbury. It would repay anyone who was interested in gas to go and look at what Mr. Pond had achieved in his method of lighting and ventilation. He did not wish for a moment to praise Mr. Pond's system above any other; but it was very effective. He had no doubt that Mr. Sugg's and other systems, if not equally effective, were in their way quite as useful; and he hoped that all these systems would be multiplied. Mr. Foulger presided on the occasion in question in his private capacity, and not as an official of this Company. With respect to the question as to how soon the price of gas might be reduced, there was a good old proverb which counselled one not to prophesy unless he knew. He did not know when their price was likely to be reduced, and he had said not in the immediate future; but if they were to have an increase in their business "by leaps and bounds," as had sometimes been the case, that would make a difference. If, however, trade were to be bad, and they were to lose ground, the period of lowering the price would be retarded in a corresponding manner. Of course, a great deal depended on the nature of the seasons, the character of the winter, and all the various things which entered into and governed the sale and use of gas, which they did their best to promote. With regard to the question of the price of gas for the automatic meters, they had not gone into the matter at the present time. It would, however, be watched carefully by the Directors.

The motion was then put, and carried unanimously.

Resolutions were afterwards passed declaring the dividends recommended, authorizing the raising of further capital by the creation and issue of a sum not exceeding £150,000 of new ordinary stock, and empowering the Directors to dispose of a portion of the Company's property not now required for the purposes of the undertaking.

Mr. H. Rokeby Price then proposed a vote of thanks to the Governor and Directors. Referring to the question of the consolidation of their stocks, he stated that this measure would be of great advantage to the various holders. At present it was difficult to sell some of the small stocks, as they were not known; whereas if they were amalgamated into one stock, they would be much more marketable, and would command a much better price. He need not say what an advantage the consolidation would be in the matter of simplifying the books of the Company. He was only sorry that their Company had not taken the lead in this matter, instead of Mr. Livesey; but they were very glad at what that gentleman and his Company had done in this direction.

Mr. W. Griffith seconded the motion, which was carried unanimously.

The Governor, in acknowledging the vote, said he entirely agreed with what Mr. Rokeby Price had said—that nothing could be more convenient than a consolidation of their stocks. Mr. Price had remarked that he wished their Company had preceded Mr. Livesey in this policy. But Mr. Livesey was an older gas manager and more experienced than he (the speaker) was; and in a matter of this sort, he was always very glad to follow Mr. Livesey's lead. They had differed from time to time, and perhaps they might differ again; but he was sure there was no ill-feeling between them on that account.

The proceedings then terminated.

The Assessment of the Ramsgate Gas-Works.—The Assessment Committee of the Isle of Thanet Union having raised the assessment of the gas-works of the Ramsgate Corporation in Ramsgate and St. Lawrence from £2500 to £5305, the Corporation appealed, with the result that the old figure has been retained.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. HOWARD C. WARD in the chair.

The SECRETARY (Mr. W. Croxford) read the notice calling the meeting; and the report and accounts, of which an epitome appeared in last week's issue, were taken as read.

The CHAIRMAN said the Directors would have had great pleasure in bringing the present accounts before the proprietors, and in congratulating them upon the capital results of the half-year's proceedings, if it were not for two items, over which, happily, they had no power whatever. During the half year they had had an increase in the sale of gas of about 1·64 per cent., compared with the corresponding period of last year. It would be in the remembrance of the proprietors that the half year ending June, 1895, was a severe one in point of cold, and this stimulated the consumption of gas to a considerable extent. If they compared the sale of gas in the half year with that in the six months ending June, 1894, it would be found that there was an increase of 12·44 per cent., or an average of about 6 per cent., which showed that the Company were making good progress. With regard to the residual products, the Directors could not, of course, command the prices of coke, tar, or ammoniacal liquor. It was with great regret that the Directors found these products had fallen in value to such a large extent. They had a diminished income from coke of £5120 in the half year; and every item under residuals, excepting breeze, had decreased—the total reduction being £6157. The accounts showed the absolute result of the sales of the coke made, as, at the present time, they had only about 200 tons to sell. Regarding the other item over which the Directors had no control, he said it was a most serious thing. He could not think it was wise on the part of the local authorities, in the interests of the consumers, that they should pile up the assessments in the manner they had done. Twelve months ago the charge for rates and taxes in their accounts was about £5000 for the half year; and in the present accounts, it was £8000—that was an increase of £3000, which was equal to 60 per cent. The Directors had, of course, opposed the increase; and they were doing so now. But the remedy was often worse than the disease, as expensive witnesses had to be engaged on both sides; and if the case went against them, they had the whole of the costs to pay. The report referred to the reconstruction of No. 2 gasholder at the Brentford works. The tank was in good condition; but the holder (which had been in use for forty years) now required renewing. Having alluded to the establishment of show-rooms for gas appliances at Chiswick, Ealing, and Brentford, the Chairman remarked that a wonderful feature in the progress of the Company, and a most gratifying one, was the increase in the supply of gas by prepayment meters. The lead in this direction was taken by Mr. George Livesey; and they had quickly followed in his footsteps—in fact, they were fixing these meters as fast as they could get them. They reckoned that the average consumption by the penny-in-the-slot meters was 14,500 cubic feet each; but in the case of The Gaslight and Coke Company, it reached 20,000 cubic feet. They (the Brentford Company) did not confine themselves to the penny-in-the-slot meter; but they had also introduced those which were operated by shillings. These meters were most useful, and appeared to be much appreciated not only for lighting but for governing the consumption of gas for cooking purposes. The number of consumers upon the prepayment system at the end of June last was about 6675, which was an increase of nearly 100 per cent. over the corresponding period of 1895. The report announced that the Directors were about to issue further stock. The accounts showed that they had spent virtually the whole of their capital—except £1400. Of course, the rapid increase of business in stoves and meters put the Company to considerable expense; and they required a good deal of ready money. It would therefore be necessary for the Directors to offer by tender a further sum of £30,000 of new 1881 stock. As to the accounts, he said that in every particular, save in the two items he had specially referred to, they showed favourable results. Against the accounts they had the falling off in the residuals of £6157, and the increased expenditure on rates of £3000—the two together making £9157, which was a considerable sum upon the amount of money to be applied to dividend in a Company like theirs. Every one of the other items which were against the accounts were only such as one would expect to find increasing by reason of the general and rapid growth of the business. Alluding to the items under the head of manufacture, he mentioned that the adoption of the inclined retort system had been marked by complete success. When at the works a few days since, the Directors witnessed the operation of these retorts. Ten of them were fully drawn and ready for charging in five minutes; and where only five men were now employed, they formerly had thirteen under the old system. As to the items in favour of the accounts, they had an increase in the gas, meter, and stove rental of £2672. They had a comparatively small increase in the sale of gas by reason of the mild season—only 1·64 per cent.; while in the rental of meters and stoves, they had an increase of about 11 per cent. This was a favourable point, because it showed they were providing future business at a considerable and rapid rate. For breeze, they had obtained an increase of £78 In regard to coal, although they had increased the amount carbonized, they had a saving of £1870, which was very gratifying. The most satisfactory feature of all upon the debtor side of the accounts, was the carbonizing wages. In the half year ending June, 1895, they had a saving of £1347 in that item; and in the past half year, although they had been increasing the quantity of coal carbonized, they had a further saving of £1532. In fact, the wages for carbonizing had gone down from 2s. 9d. per ton of coal in 1894 to 2s. 7d. in 1895, and 2s. 3d. last half year. This was due to the increasing use of inclined retorts. He commented upon the ease with which these retorts were manipulated, and upon the great use they would be to companies who were overtaken by troublous times in connection with labour. Continuing, he said the result of the half-year's working was a profit of £30,151, as against £36,756 in the corresponding half of 1895, which was a falling off of £6605. In order to pay the dividends recommended, they had a deficit of £6597 to take from the undivided balance; but had it not been for the two adverse items of residual products and wages, they would have had a surplus, after paying the dividend, of about £2500. He concluded by moving the adoption of the report and accounts.

Mr. J. ORWELL PHILLIPS seconded the motion.

The CHAIRMAN, replying to a question, said the incandescent gaslight had been adopted in the main street of Chiswick and in Hammersmith. It was making good headway in the district.

Sir R. H. WYATT bore testimony to the value of incandescent lamps for private lighting. With regard to the statement of the Chairman that the Company was making satisfactory progress, he said his impression was that members of Assessment Committees read the reports of the proceedings at the meetings of public companies; and when they saw they were making "satisfactory progress," they said: "We will make satisfactory progress with the assessment too."

The motion was unanimously carried.

Dividends at the rates per annum of 5 per cent. on the 5 per cent. preference stock, of 12 per cent. on the consolidated stock, and 9 per cent. on the new stock, were declared.

On the proposition of Mr. H. ROKEBY PRICE, seconded by Mr. T. S. BORRADAILE, a hearty vote of thanks was passed to the Chairman and Directors for their services.

PROVINCIAL GAS AND WATER COMPANIES.

We commence to-day our usual epitome of the progress of the principal provincial Gas and Water Companies during the past half year, as revealed by the reports and accounts submitted to the shareholders.

Gas Companies.

The accounts presented at the half-yearly meeting of the Chester United Gas Company last Wednesday showed that the receipts in the six months ending June 30 last amounted to £16,501; and the expenditure, to £10,661—leaving a balance of £5840. The sum available for distribution was £4727; and the Directors recommended the payment of the statutory dividends on the ordinary stocks. The works and plant, under Mr. R. Hunter's supervision, have been maintained in a satisfactory condition.

The quantity of gas sold by the Dorchester Gas and Coke Company, Limited, in the half year ending June 30 last was 13,178,700 cubic feet, producing £2658; and the total revenue was £3220. The expenditure being £2201, there was a profit of £1019 to go to the net revenue account. The amount available for distribution is £1172; and the Directors recommend the usual dividends of 10 and 6 per cent. per annum, less income-tax on the preference capital. The reserve fund has been increased by £22. Under the supervision of the Manager and Secretary, the works in connection with the new holder are progressing satisfactorily.

The report presented at the annual meeting of the Hoylake and West Kirby Gas and Water Company, Limited, on the 30th ult., showed the following balances available for division: Gas, £1419; water, £1261—together, £2680. The Directors recommended dividends of 9 and 7½ per cent. on the gas capital, which would absorb £1224; and of 5 and 3½ per cent. on the water capital, taking £1240—together, £2464, and leaving £216 to be carried forward. With the interim dividend paid in January last, the total for the year was 13 and 10 per cent. on the gas, and 9 and 6·3 per cent. on the water capital. New machinery at the works was completed and taken over from the contractors in May last, since which time it has acted satisfactorily. The District Council have lately approached the Company with the view of purchasing the undertakings.

The annual meeting of the Kildwick Gas Company was held last Tuesday. The report stated that the profits for the year—including £322 brought forward, and deducting £200 for depreciation—amounted to £2279, out of which an interim dividend of 2½ per cent. had been paid; leaving £1554 to be disposed of. The Directors recommended the payment of a further dividend of 3 per cent. less income-tax, which would absorb £870 (making 5½ per cent. for the year), and the addition of £250 to the reserve fund. It was mentioned that a new gasholder was in course of erection. The report was adopted.

The annual accounts of the Leatherhead Gas Company show continued prosperity. The sale of gas realized £3161; and residual products £590. The expenditure totalled to £2919; and the balance of profit on the year was £927. A dividend of 8s. per share, making 8 per cent. for the year, was declared at the recent meeting of the shareholders.

The profit realized by the Town and County of Poole Gas and Coke Company, Limited, in the half year ending June 30 last was £1105, as compared with £1235 in the corresponding period of 1895. This difference is more than accounted for by the reduction of 3d. per 1000 cubic feet in the price charged to private consumers since the Midsummer quarter of last year. The total receipts in the six months were £3404; and the expenditure was £2299. The amount available for division at the half-yearly meeting was £4793; and the Directors recommended the payment of maximum dividends, less income-tax. The increased consumption of gas renders an extension of the purifying plant necessary in the near future. The works, under the supervision of Mr. W. Davis, the Manager and Secretary, have been well maintained

At the half-yearly meeting of the Weymouth Consumers' Gas Company on Thursday, the Directors will report that the business retains its sound condition; the returns for the six months ending June 30 last comparing favourably with those of previous similar periods. The 27,692,200 cubic feet of gas supplied for public and private lighting produced £5273; the sale of residuals, £844; of gas-fittings, £234—the total revenue being £6482. The expenditure on the manufacture of gas amounted to £3156 (coals, of which 3264 tons were used, costing £2218); and the total outlay was £4452. The balance carried to the net revenue account is £2030. The amount available for division is £2806; and the Directors recommend dividends at the rates of 10 and 7 per cent. per annum.

The report presented to the shareholders of the York United Gaslight

Company at their meeting last Thursday showed a sum of £9271 available for dividend and interest; and the Directors recommended the payment of the usual 5s. per share for the past half year, on both the old and new shares, free of income-tax. In the previous half year, the profit fell short of the dividend and interest by £950; but this deficiency, as the Directors anticipated, has now been more than recouped, as the result, in the first place, of the first half of the present year being the best one for profit, and in the second from the working expenses being unusually light. The gas consumption fell off to the extent of rather over 2 per cent., owing to the mildness of the winter quarter, as compared with the exceptionally severe weather in the corresponding period of the previous year. The June quarter of the present year, however, shows the usual average increase. Under the supervision of the Company's Engineer and Secretary (Mr. C. Sellers) the machinery and plant have worked well; but in order to keep abreast of modern improvements, the Directors are contemplating some special changes in the near future. The Chairman (Mr. J. F. Taylor), in moving the adoption of the report, referred to the small decrease in the consumption of gas, and said the responsibility for it had been very properly put upon the weather. He remarked that there was, perhaps, no business more sensitive to weather influences than that of gas supply for both lighting and warming; and if the consumers, when comparing their accounts, would remember this fact, it would often save them from blaming meters and burners for little increases in consumption when those appliances were perfectly innocent. While upon the subject of gas consumption, it might, he said, be interesting to refer for a moment to gas-burners, and to add that the public would probably not have to wait long before the incandescent patents would have run out, and other improvements made; and then would come what the public were wanting—viz., free trade prices. But in every direction the improvements in utilizing gas for lighting and fuel purposes were simply marvellous—in fact, with intelligent management in a household, lighting, warming, and cooking by gas could not—upon the question of cheapness—be equalled. The report was adopted; and the dividend recommended was declared. The Lord Mayor of York, in moving a vote of thanks to the Chairman and Directors, referred to the remarks made by Mr. Taylor on the subject of incandescent gas-burners, and said that, light for light, they would compare favourably with electricity, which would cost twelve times as much as York gas at its present price. He directed attention to the cheapness of gas in York—2s. 1d. to 1s. 10d. per 1000 cubic feet—as compared with other large towns; and taking into consideration the fact that York was far from the coal-fields, said it reflected great credit on the Company that their charge was so low. The members of the Corporation had to face the question of the introduction of the electric light into the city. The feeling which he knew existed on the subject should be respected; and it was to the effect that the citizens were thoroughly satisfied with gas at its present price, and did not wish to have the luxury of the electric light at the cost of the ratepayers. The motion was carried, and briefly acknowledged by the Chairman.

Water Companies.

The rental of the Camborne Water Company in the past half year amounted to £1222; and the expenditure to £433. The disposable balance is £794, out of which dividends of 10 and 7 per cent. are recommended.

The half-yearly report of the Directors of the Cleveland Water Company shows that, after providing for preferential charges, there is a balance of £3475, which has enabled the payment of dividends, at the rate of 8 per cent. per annum on the original and "A" shares, and £5 12s. per cent. on the "B" shares. After reserving £125 for contingencies, a balance of £630 remains to be carried forward.

The half-yearly profit and loss account of the South Hants Water Company shows an available balance of £3110 for the six months; and the Directors propose to pay an interim dividend at the rate of 5 per cent. per annum on the ordinary shares, and at the rate of 3½ per cent. on the new shares. To meet the increase and prospective requirements of the Company, the Directors will ask the proprietors at the coming meeting to authorize the raising of additional capital to the extent of £10,000, and also £5000 of 4 per cent. debenture stock.

In the report to be presented by the Directors of the South Staffordshire Water-Works Company at the half-yearly meeting on the 27th inst., they state that the number of houses laid on during the six months ending June 30 last was 1508, making the total supplied 89,881. The gross amount of water-rates was £45,454, against £42,551 in the corresponding period of the previous year. After providing for interest on debenture and preference stock, the amount remaining for division (including £3194 brought forward) is £20,064; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 5½ per cent. per annum, less income-tax. The amount of the dividend being £15,817, there will remain £4247 to the credit of next half year. The report of the Engineer (Mr. H. Ashton Hill) as to the condition of the Company's works is that they are in substantial order and repair.

The Truro Water Company's half-yearly accounts show receipts amounting to £1014, and an expenditure of £545. A dividend at the rate of 3 per cent. has been declared.

At their half-yearly general meeting last Thursday, the Directors of the York New Water-Works Company reported that, although there had been a satisfactory increase in the income from water-rents in the six months ending June 30 last, the total revenue had diminished by reductions in charges under the new statutory scale. Owing, however, to the past mild winter, the charges for repairs were considerably below those in the corresponding half of 1895. The balance in the revenue account was £7347; and the Directors recommended dividends of £10 7s. 5d., and 3½ per cent. per annum upon the various shares.

The Working Up of the Gas-Works Residuals by the Manchester City Council.—Mr. Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, reported at last Wednesday's meeting of the Council that the Royal Assent had been given to the application of the Committee for power to manufacture the residual products of the gas-works. This power, however, would not be exercised until it was considered advisable.

PROGRESS OF THE GAS SUPPLY OF SALFORD.

At the Meeting of the Salford Borough Council last Wednesday, the report of the Gas Committee (which was adopted) stated that—although, owing to the reduction in the price of gas and to the depression in the coke and sulphate markets, the amount of profit this year was considerably less than usual—the business of the department continued to increase. Notwithstanding the competition of the electric light, there was an increase of 34,394,000 cubic feet, or 3·16 per cent., in the quantity of the gas sold. While at present there was no sign of improvement in the values of coke and sulphate, the Committee had reason to expect an advance next year in the receipts for tar; and they hoped that the reduction in the price of gas, equal to 2d. per 1000 cubic feet, which commenced in October last, would tend to increase the consumption. The quantity of coal and cannel carbonized during the year was 124,610 tons. The quantity of gas made was 1,243,531,000 cubic feet; and the amount sold and used, 1,122,261,000 feet. During the year 4305 yards of new mains had been laid; also 5498 yards of mains to replace others of less dimensions.

BONUS DAY AT THE SOUTH METROPOLITAN GAS-WORKS.

The Workman-Director Proposal—Results of the Profit-Sharing System.

The annual celebration of the establishment of the profit-sharing scheme of the South Metropolitan Gas Company was held in the recreation grounds at the Old Kent Road works, on Saturday, the 1st inst. By four o'clock in the afternoon, the place presented a very animated appearance. The sun was shining brightly; marquees, flags, and other decorations were lending their aid in relieving the dulness of the surroundings; lively music was being discoursed by the band of the Old Kent Road works; and large contingents of men from the various stations (who were in numerous cases accompanied by their wives) were present. What was aptly described by one speaker as the "ordinary general meeting" of the Directors, officers, and men was commenced soon after 4 o'clock; Mr. GEORGE LIVESEY presiding.

The CHAIRMAN, who, as usual, was heartily received, said this was the seventh occasion on which they had met to celebrate their profit-sharing arrangement. Perhaps the first thing he had better touch upon was the question of the Company's Bill, as he knew a good many of the men were interested in it. It had at last passed both Houses of Parliament, and now only awaited the Royal Assent; so that it was perfectly safe. There was only one thing about it he regretted. They had in it a workman-director clause, which, when the men's investment in the Company reached not less than £50,000, would enable the Directors to make arrangements for the workmen to elect one or two of their fellows to sit on the Board to assist in the management. There had been a great deal of difficulty about this; but it had all gone smoothly at last. He ought to say a word—and he could say it the better because his colleagues who were opposed to it were absent (laughter)—in their defence. The Directors who had objected to this proposal (and they had, he thought, from their point of view very good grounds for their objection) were, he was quite certain, honest and well-meaning men; and as to any idea of not liking to have a workman sitting alongside them on the Board, they were too much of real gentlemen to allow a thing of that sort to weigh with them. But they had read and heard a great deal about working men, and knew how they were influenced by trade unionist agitators. Only that week there had been a very striking object-lesson during the meeting of the International Socialist Workers and Trade Unionists in Regent Street. All he could say was that, if they were the class of men who were to elect workman-directors, he would have been as much opposed to the proposal as any of his colleagues, because he felt they were not the men who were anxious to promote good feeling between capital and labour; but their object was war against capital, and its entire destruction. Well, his colleagues feared there was the danger that the Company's men might be misled by some glib-tongued fellow, who would make all sorts of promises—that he would do this, that, or the other; and he would not be a proper man to elect. To send such a man to the Board would upset the whole thing, and destroy the harmony that now existed between employers and employed. There was a great deal to be said from the standpoint of his fellow-Directors; but what he said was this: "It is necessary that working men should be educated in the responsibilities of management; and how are they to learn in that school without the opportunity of practice?" What they were now proposing to do was to give that opportunity. Their original intention was that no man should be eligible as a Director unless he had been seven years in the Company's service; and unless he had invested £100 in the Company's stock. Everybody connected with the Company was satisfied with this. There were no objections. When, however, it came before the Committee of the House of Commons, without hearing a particle of evidence in respect to it, they simply altered the £100 to £250 of stock—equal to £340 in money. He applied to certain members of the Government who were favourable; and to other gentlemen in the House of Commons of Cabinet rank, who were also favourable. But they said they could not very well upset the decision of a Committee. He then wrote to the Duke of Devonshire; and received from him a very kind and sympathetic letter. He also had a letter from Mr. Thomas Burt (who represents labour in the House of Commons), sympathizing most thoroughly with them. The Duke of Devonshire, however, said he could not move an amendment in the House of Lords, because he was a Cabinet Minister; but he suggested the name of Lord Camperdown. He (the Chairman) wrote to his Lordship; and the Duke saw him. Their Secretary and he (Mr. Livesey) also had an interview with him. His Lordship said he was quite with them in this matter, and took a great deal of trouble about it. Leading men in both Houses asked the Chairman of the Committee who had considered the Bill, whether, if the Lords amended this clause, he would allow it to pass the House of Commons unopposed. He said "No." He (Mr. Livesey) had very little acquaintance with noble Lords. Still, from what he had seen of them, he was bound to say they were fair men; those he had spoken to were most fair and sympathetic towards labour, and most anxious to do what they could to facilitate a great experiment.

Seeing that, if the Bill were opposed on going back to the House of Commons, there would be danger of its being lost, the Directors thought it best to run no risk. They therefore took it as it was. They had the workman-director clause, powers for the conversion of the capital, and other things they wanted; and no doubt they would find a way in the future of getting over the difficulty as to the qualification of the workman-director. It would be an easy matter, in a year or two, to introduce a Bill in Parliament to repeal this obnoxious amendment, and put the matter right. Providing the men showed sufficient interest in the matter to warrant the Directors in saying they ought to be entrusted with a share of the management, the difficulty would be overcome in some way. Coming to the more immediate purpose for which they were assembled, the Chairman said, on this occasion, there was one adverse point upon which he had to speak. The Directors had been very pleased with the confidence their workpeople had shown in the Company by leaving their money in their hands. Hitherto there had been an increasing number of men who left the withdrawable portion of their bonus to accumulate; but this year, he was sorry to say, there had been a change. Last year 56 per cent. of the men left their money in the Company's hands; while this year the percentage was only 38. Taking the actual numbers, 1520 men had withdrawn what they were able to withdraw—that is, half their annual bonus; while, if the proportion had been the same as last year, it would only have been 1088—showing that 432 men had withdrawn their money beyond the number last year. He was sorry for this, because he could not understand it. What was the reason? He found that at nearly all the works it was the same, except "little" Greenwich; and here he must say again that old Greenwich headed the list by a long way. Whereas only 33 per cent. of the men at Greenwich withdrew their money last year, only 31½ per cent. had withdrawn it this. The figures for Rotherhithe were 64 per cent. last year, and 81 per cent. this; for Old Kent Road, 41 per cent. last year, and 59½ per cent. this; and Vauxhall, 36 per cent. last year, and 66 per cent. this. There must be some reason for this. Was it a feeling of want of confidence in the Company, or had a spirit of extravagance or recklessness taken possession of a large number of the men? He wished some of them would tell him. This was defeating one of the main objects of the profit-sharing system, which was to enable the men to put by money for a rainy day or old age. While 1500 had withdrawn half their money, 900 odd had allowed theirs to remain; so that was, after all, a good proportion. Nearly 1000 men had not only left the half of the bonus which they were obliged to leave by their agreement to be invested in stock, but they had allowed the other half to accumulate! This was very satisfactory indeed; but he wished more would follow their example. Speaking next of the management of the Company, and of the difficulties they had to contend with, the Chairman stated that they had nearly 150,000 consumers—50,000 odd being on the penny-in-the-slot system. It was not an easy thing to satisfy all these customers; and one thing they wanted a workman-director for was that the men might understand something of the difficulties pertaining to the management of a concern like that. It could only be managed in one way, and that was by the hearty co-operation of all ranks in the service. A large number of their people did take an interest in the success of the Company; and it was greatly due to the bond of union that had been created by the profit-sharing scheme. About £35,000 had been invested in the Company's stock by the profit sharers; and they had rather more than another £35,000 on deposit at 4 per cent. There was £70,000—the accumulation of seven years—which, he thought, would not have been in existence if they had not started this scheme.

Mr. Simpson Rostron (one of the Directors), in the course of a few remarks, pointed out that, by the conversion of the capital, the enormous premium which the stock commanded on the market would disappear; and they would be able to obtain £5 of stock for about £7, or, at all events, for something quite reasonable.

Mr. Frank Livesey, the Chief Engineer, remarked that, although the Company had distributed among the men about £70,000 under the profit-sharing scheme, he did not believe the consumers had suffered—in fact, he felt sure that, if there had been no profit-sharing scheme, the price of gas would now have been 2s. 4d., instead of 2s. 3d. Referring to the use of labour-saving appliances, he said they were bound to introduce them in order to produce gas as cheaply as possible. It might be pointed out that the number of stokers had been reduced; but, on the other hand, the number of workmen had not been decreased. They had more service layers, gas-fitters, coin collectors, index readers, lamplighters, engineers' fitters, coke fillers, and other classes of men. The reduction of labour had been in that branch which was most severe. Their accounts showed that they were paying some £30,000 a year more in wages than they were three years ago, not including the officers.

Mr. Frank Bush (the Secretary of the Company) observed that his friend the Engineer had stated that £70,000 had been distributed among them during the past seven years; but it was rather more than £80,000. For the past year, the amount was higher than in any previous year; being no less than £17,500. No "tall talk" from outside agitators could alter that. The men had had the money, and there was no getting away from it. He regretted, with the Chairman, that a larger number of men had taken out their withdrawable money; but he believed many of them had done so for desirable objects.

Addresses were also delivered by Mr. C. C. Carpenter, Mr. A. F. Browne, and Mr. J. Tysoe (the Engineers of the Vauxhall, Rotherhithe, and East Greenwich stations), Mr. John Surman (the next oldest servant of the Company to Mr. Livesey), Mr. H. C. Sims (the Secretary of the Profit-Sharing Committee), Mr. C. Tanner, sen., and Messrs. Austin and Day, as representatives of the men.

A very hearty vote of thanks was then passed to the Chairman for presiding.

Immediately at the close of the meeting, tea was served in one of the large marquees. Subsequently there was a most interesting and instructive display by the Company's No. 1 division of the St. John's Ambulance Brigade, followed by a concert by officers, workmen, and friends. At intervals during the afternoon and evening, selections of music were performed by the bands of the Old Kent Road, West Greenwich, and Rotherhithe works.

ELECTRIC LIGHTING NOTES.

The special Electric Lighting Committee appointed by the Battersea Vestry have resolved to ask the London County Council for a loan of £4200 for carrying out an electrical installation in connection with the municipal buildings, Town Hall, and Central Library. On the other hand, a Committee of the Battersea Tradesmen's Club who have inspected the St. Pancras electric lighting works report that the method adopted there is a very expensive one—the only hope of economy being in the sale of electrical energy during the daytime for driving machinery. In their opinion, the dust destructor at St. Pancras does not help the electric lighting, but, on the contrary, electrical energy has to be employed to supply an air-blast to help the dust destructor—a point which may be commended to the Town Council of Canterbury and other councils who are under the impression that they are going to convert dust into electrical force by using the refuse as fuel to generate power. Again, the Committee state that it is evident at St. Pancras that a dust destructor cannot be used for generating electricity except at the price of its efficiency as a destructor.

The Coventry City Council are the possessors of both gas and electric lighting works; but there appears to be a decided preference among the members for the former illuminant for lighting the streets. At the last meeting, a motion was brought forward by Mr. West to the effect that it was desirable certain thoroughfares should be illuminated by electricity, and instructing the Electric Lighting Committee to prepare a scheme for the purpose. Mr. West backed up his proposal by an "opinion" from Mr. R. Hammond as to the "benefits" of public lighting by electricity, and a declaration by that gentleman that, "according to the latest statistics, it is considered that from 1½d. to 2d. per unit is sufficient to cover the cost of public lighting supply." The number of gas-lamps to be displaced was 52, the total candle power of which was estimated at 1885, and the total cost about £217. In their stead, it was proposed to put up 22 electric arc lamps of 800-candle power, which, at £18 each per annum, would make the total cost £396. Notwithstanding the assertion that the electric lamps would have a total candle power of 17,600, as against 1885 in the case of the gas-lamps, the Council rejected the motion by ten votes to five.

The Manchester City Council have made a further reduction in the price of electricity to large consumers. The charge to such consumers has hitherto been 4s. per quarter per lamp, and 2d. per unit of current. It will now be 3s. per quarter per lamp, and 1½d. per unit, which is equal to a reduction of 25 per cent.

The Local Government Board have sanctioned the borrowing of £11,134 by the Derby Town Council for electric lighting.

The minutes submitted by the Electric Lighting Committee at the meeting of the Hull Town Council last Wednesday contained the recommendation that a second central station should be established, at an estimated cost of £42,000. The scheme, however, did not meet with general acceptance; and, on a division, the minutes were rejected.

Mr. J. H. Rider, who was recently appointed Borough Electrical Engineer at Plymouth, has submitted to the Corporation the outlines of a scheme of electric lighting and tramway traction for the borough, the initial cost of which is estimated at £46,000. For private lighting he recommends the adoption of the alternating current system with low-pressure distributing mains fed from transformer sub-stations for the main streets, and with high-pressure distribution and separate transformers for the more scattered areas. The public lighting in the centre of the town, including the Hoe, is to be furnished by 74 arc lamps of 1500-candle power. These will displace 123 gas-lamps; and Mr. Rider computes that the new means of illumination will give a total light of 111,000-candle power in place of a present total of 730 candles. For years past there have been complaints of the manner in which the Corporation have starved the public lighting, particularly of the Hoe; but the ratepayers are not to get the better light without paying for it. Each of the arc lamps is to be charged for at the rate of £16 per annum; and the total cost will be £1184, against the £475 a year now paid for gas. The plant proposed to be laid down is to have a nominal capacity of 600 kilowatts, which will give an effective output of 400 kilowatts; leaving 200 kilowatts to spare. This would, says Mr. Rider, enable the equivalent of between 7000 and 8000 8-candle power lamps to be supplied at one time, besides the arc lighting and power for working one section of the tramways. An essential feature of the scheme is that electricity will be supplied for working the tramways, which are a municipal undertaking. Carrying out an idea which he recently expounded before the Association of Municipal Electrical Engineers, Mr. Rider proposes to erect a battery of accumulators at the works, and to utilize the power of the machinery in charging them during the hours of light load. For the present, only one section of the tramways is to be actuated by electricity; and the charge for the current is to be at the rate of 3½d. per unit. The current supplied to the public lamps Mr. Rider works out on the estimated consumption at a cost of 3·43d. per unit; while to private consumers the charge proposed to be made is 8d. per unit for all current supplied to lamps which burn one hour a day or less, and 3d. per unit for all above one hour. Assuming that there will be a connection of 7500 lamps, he estimates the income for private lighting at £3000; while the tramways will yield £2143, and the public lighting £1184—a total of £6327. The working cost is estimated at £3815; leaving a balance of £2512 to pay the interest and sinking fund, which on £46,000 will amount to £2497.

New Offices for the Cardiff Gas Company.—More than ordinary interest attached to the proceedings at the half-yearly meeting of the Cardiff Gas Company last Wednesday; this being the first time the proprietors had assembled in the handsome new suite of offices which have lately been completed. The formal opening was inaugurated by Mr. Henry Morley, the Engineer, presenting the Chairman (Mr. C. H. Williams) with a gold key bearing a suitable inscription. Thereupon the Chairman declared the building open, and invited those present to inspect the offices and show-rooms. General satisfaction was expressed by the shareholders at the complete arrangements made for the convenience of the constantly increasing number of consumers in the Company's district.

THE USE OF GAS-ENGINES FOR ELECTRIC LIGHTING AT BELFAST.

The Electric Lighting Committee of the Belfast Corporation are prepared to make some considerable extensions in their works; but before these can be taken in hand, the gas-driven plant now available at the central station will, in all probability, be fully utilized. In view of this, the Committee have been discussing the desirability of making some additions to the existing gas-worked plant. Speaking on the subject at the meeting of the Corporation on the 1st inst., Mr. G. Andrews said the Committee had not yet arrived at any definite conclusion as to the amount of plant that would be at present required; but they roughly estimated it as equivalent to about 7000 more lamps —bringing up the possibility of wiring to 20,000 lamps. At the present time, their safe limit, allowing the ordinary light by engines—that was one large engine and one small—was almost fully absorbed. They had about a free margin of 1000 8-candle power lamps. Therefore, it was absolutely necessary for the Committee to take this matter of increased generating power in hand within a short time. The makers of the last gas-engines, which had been running fairly satisfactorily, said they now saw where the difficulty existed, and that they could overcome it, and deliver an engine, or a couple of engines, within a very short time. The difficulty would be in obtaining dynamos; the makers being so busy at the present time preparing for the coming winter season. It was rather early yet to bring forward the larger scheme, the outlay on which would be so considerable that it would have to be included in the report of the Finance Committee for next year. It would amount, he might say roughly, to about £100,000, and this would give them a supply sufficient to enable fully six times the present number of lamps to be wired. Mr. Woodside inquired whether gas-engines were most economical. He also wished to know whether the makers of the engines were responsible for the cost of altering them where they did not work satisfactorily. Mr. Young protested against any increase of the driving power at the present central station, which was situated next door to a chapel; and he warned the Council that they might have a serious action for injury to the surrounding property. The sooner they removed the station to the banks of the Lagan the better. Mr. Barklie remarked that he had no doubt that, when they had steam power, they would be able to supply electricity at a cheaper rate. Mr. Andrews, in reply, said they were at present paying nearly three times as much for their fuel as they would with a steam-driven engine. At the same time, the Committee could not accept the responsibility for the position, but must do the best they could with the plant at their disposal. Taken all round, the plant was at present working satisfactorily; and, with regard to the last two engines, the makers were bearing all the expense of making them efficient. He had reasonable ground for stating that they would make those engines much more efficient than the original ones, which were of a different type. With the high cost of fuel, they could not possibly make any show in the way of earning a profit; but if electric lighting went on as it had been going in Belfast, there was no doubt they would be able in time to show a surplus at least sufficient to pay interest. The Committee's minutes were adopted.

Darlington Gas-Works Extensions.—The Darlington Corporation Gas Committee have appointed a Sub-Committee to confer with and instruct Mr. Charles Hawksley as to the preparation of plans for the proposed new gasholder and extensions at the works. Application is to be made for power to borrow £30,000.

Abandonment of Oil Lighting at Plympton.—After a trial extending over several years, oil lighting is to be relinquished in the streets of Plympton; and in the coming winter gas will be supplied to the street-lamps under contracts with the Gas Company. At meetings of the Parish Councils of Plympton St. Mary and Plympton St. Maurice last Tuesday, tenders were received from the Company and from a London firm who had the previous contract for oil lighting. The tenders for the latter were more favourable—the offer being to supply lamps of 35-candle power at 33s. 6d. per lantern; while the Gas Company offered lights of 18-candle power at 33s. per lantern. In connection with gas lighting, there was also the cost of purchasing new lanterns and of repairing the old ones, which have been stored while out of use. Both Councils, however, decided to go in for gas lighting; and the decision was confirmed at a public meeting on the following evening, in spite of a strong effort to upset it.

The Quality of West Bromwich Gas.—At a meeting of the West Bromwich Town Council last Wednesday—the Mayor (Mr. G. Salter) presiding—the Gas Committee reported that the Borough Gas Examiner had presented a report for the quarter ending June 30, giving a summary of his tests during that period both as regards illuminating power and pressure of the gas supplied, and stating that on every occasion on which it was tested it was well above the legal requirements. Alderman Farley, in moving the adoption of the report, said the gas now being supplied to the customers was good, and there were no complaints. Mr. Brockhurse, however, had given notice of the following resolution; and he proceeded to move it: "That, in the interests of the ratepayers and gas consumers, this Council instructs the Gas Committee to fully investigate the statement which has gained currency that atmospheric air has been put into the gas, and in their report to the Council to state whether such action would account for the poor quality of the gas, and to what extent it would influence the revenue; and, further, whether the increased output of gas for the past year in proportion to the amount of coal could by such means be accounted for." Alderman Farley said he believed that in the Manager at the gas-works (Mr. T. Glover) they had a very good servant, who was doing his best to make the concern a success. Under these circumstances, he considered it was undesirable that he should be badgered, or hampered in his duties. After a brief discussion, Mr. Brockhurse agreed to withdraw his resolution, on the understanding that the matter should be brought before the Committee, who should report thereon to a future meeting of the Council.

METROPOLIS WATER SUPPLY.

The Scarcity of Water in East London.

The reassuring statements made in the House of Commons on the 31st ult., by the President of the Local Government Board, that an auxiliary supply of water would be furnished to the East London Company by the New River Company, and that the former Company were willing to assist the poorest inhabitants of their district by contributing to defray the cost of distributing receptacles for the storage of water, were not very helpful in allaying the irritation prevailing in the East-end of London at what is characterized as a thoroughly discreditable condition of things brought about by the curtailment of the water supply. Discounting to a very large extent the sensational reports which appear in the evening papers, letters in "The Times" and the testimony of medical men in the districts specially affected go to show the existence of a deplorable state of affairs among the classes to whom a full supply of water is specially needful. It is true that these classes are more wasteful than judicious users of this valuable fluid; and this fact, coupled with the absence of means of storage and the present exceptionally dry season, no doubt largely accounts for the existing trouble. Much abuse has been heaped upon the Company, whose Secretary (Mr. I. A. Crookenden) has been heavily taxed in replying to the various charges brought against them; among these being that their conduct has been the cause of disease and death. Even "The Times" has deemed the matter of sufficient importance to be investigated by a Special Correspondent, whose account of what he saw may be taken as that of an unbiassed observer. At the close of a graphically written article, he says: "I have met with no evidence that anybody is without water; and if they had means of storage, all would have ample. The worst cases are no doubt those in which all the utensils are lacking from extreme poverty. But these seem to be few; and they will be relieved by an arrangement just made by the Water Company for supplying all who need it with earthenware vessels for purposes of storage. Next to these, the most severely hit are persons who use water for carrying on their business, such as laundresses, fish-hawkers, and lemonade-makers. If possible, some difference ought certainly to be made in favour of this class, as their livelihood depends upon a sufficient supply. The rest suffer nothing more than inconvenience, which, however, may be very serious in cases of illness, and especially of confinements. There is no reason to suppose that the public health has been injuriously affected so far. The local authorities whom I have consulted have received few or no complaints. On the whole, the poor seem to be bearing their enforced privations with a patience and cheerfulness which might well be imitated by other people." Of a very different nature are the remarks of the representative of the "Daily Telegraph," who writes as "One of the Crowd." He closes an interview with one of the medical men of the district, who assented to the proposition that "there is nothing for it but that the shamefully-used inhabitants shall suffer patiently or otherwise until the Water Company condescends to give them the relief that life or death depends on," with the following very pronounced expression of opinion: "This must not be —a more monstrous state of things it would be impossible to imagine; and if these unfortunate dock-locked islanders cannot help themselves, they must be assisted in their cruel extremity, and that without a day's delay. . . . To recognize the plea that a company is doing the best it can under trying conditions is to participate in its guilt. If, as it would appear, those responsible are incapable of doing what they are under bond to do, then they should be compelled to make way for those who are competent to do all that is required. It is not as though water enough could not possibly be obtained. It can be; and that should settle the question without further temporizing or perilous delay."

The writer in "The Times," it will be noticed, did not find evidence of the public health having suffered through the curtailment of the water supply. At an inquest held on Monday last week, however, the death of a child six months old, the son of a dock labourer, was attributed to convulsions following diarrhœa, brought on, in the opinion of Dr. Cooper Harrison, in consequence of the scant supply of water. He declared that, far from getting six hours' supply per day, he was not getting more than one hour's in his own house. Asked by the Coroner (Dr. King Houchin) if he thought the prevalent suffering, especially diarrhœa among children, was due to the want of water, he said he was sure of it. It was in consequence of the condition of the drains that the district was overwhelmed with scarlet fever, diphtheria, and other dirt diseases. On the following day, Dr. Harrison told a newspaper reporter that he had had "twenty cases directly traceable to the failure of the water supply within the past fortnight. Five of these cases were of erysipelas, ten of diphtheria, three of scarlet fever, and two of enteric fever." One family he was called to attend had, he said, "lost three children out of four, who were taken down with scarlet and enteric fever in direct consequence of the scarcity of the water supply." Questioned as to the most common results of the lack of water, Dr. Harrison said it was undoubtedly most felt by young children. Among the cases coming to him, vomiting, diarrhœa, and a modified form of cholera were fearfully common; and the death-rate was higher than it had been for years past. Another medical man—Dr. Oliver—is reported to have stated it to be double, according to his death-certificate book; while Dr. Macmorran declared it to be treble. These remarks refer to the Poplar district.

As will have been observed by the parliamentary proceedings reported last week, the public men of the affected districts are quite alive to the seriousness of the present situation, and are manifesting interest in any possible remedial measures. The member for South Hackney (Mr. T. H. Robertson) recently wrote to the East London Company suggesting that they should get water from the Grand Junction Company through the former Company's Thames main, which passes through the Grand Junction district; and also expressing his opinion that the Company might be to blame, after last year's warning, in not

having pushed on more vigorously the work at their new reservoirs. He has received from the Company's Engineer (Mr. W. B. Bryan, M.Inst. C.E.) the following reply, which will answer criticisms on this matter in other quarters:—

Dear Sir,—In reply to your letter, I may state that we have full connections on our Thames main with the Grand Junction Company; but as that main is in use from our own works, and we are pumping its full capacity, it is, of course, impossible to take any more water from any other Company into that main, as it would merely stop our own supply from being pumped into it at Sunbury.

I am quite sure that, when you know the facts of the case, your opinion will be altered as to any blame attaching to the Company, after the warning received last year, with respect to pushing on the new reservoirs so as to have them ready this year before a drought set in. No reservoir works in this country have ever been pushed forward at such a rate as have ours since last year. I may tell you that in ten months the volume of the Race-course reservoir was increased from less than 100 million to 300 million gallons; that two new reservoirs were started, one of which is practically completed. This reservoir has a top-water area of 45 acres; the puddle bank is 2200 yards long, and has had to be carried down below the natural surface of the ground into the London clay underneath; and that 700,000 cubic yards of material have been removed. The puddle trench of the second reservoir will be finished in a fortnight from now; and this reservoir will be completed by May or June of next year. If you will spare time to go over the works and see the magnitude of the progress, you will be utterly astonished. I only ask you to see one corner of one of the reservoirs at the present time, and you will then perceive the enormous difficulties we have to contend with, and which have been overcome since we commenced work in May last year. There have been nine miles of railway on the job, and a considerable number of locomotives, all of the ordinary railway gauge.

Then, again, it must be understood that, in making huge banks for reservoirs, the greatest care has to be exercised in order to avoid a catastrophe when the reservoirs are filled. Reservoir banks cannot be made in the same way as railway banks, but must be consolidated every foot in height. The weather helps as a rule; but, unfortunately, since the works began, there has been so little rain as to be practically of no use in assisting the consolidation of these great banks.

Mr. Bryan concludes by expressing the hope that Mr. Robertson will visit the works and see for himself what has been done.

On Thursday, the Directors of the Company held their usual meeting. At its conclusion, the Secretary stated that there was no prospect of any improvement in the supply. The few showers of rain which had fallen had not been of the slightest use so far as augmenting the stock of water in the reservoirs was concerned—in fact, in order to keep up the existing six-hour service, they had been compelled to further draw upon their store. They had completed arrangements with the New River Company for the transfer of 3½ million gallons of water per day into their mains; and this extra quantity of water had been supplied to the householders in the Company's district during the preceding two days. But for this, the Directors would have had to still further curtail the service. They had, however, continued to pump enough water into the district to provide the whole of the population served by them with 30 gallons of water per head daily; and they were of opinion that they would be in a position to continue to do so for some time to come.

At a special meeting of the Sub-Committee of the General Purposes Committee of the Hackney Vestry held on the same day, a letter was received from the Secretary of the East London Water Company offering to adopt any suggestion the Committee might throw out with a view of giving a better supply of water to the districts of Homerton, Hackney Wick, &c., and to alleviate the consequent distress which the shortness of the supply has brought about. It was decided that the Company should hire 40 of the Vestry's water-vans, and thus undertake the distribution of the water in the districts affected—the Company paying expenses. It was further resolved that, in order to meet cases where the poor people had no vessels for storing water, 5000 earthenware jars, to hold five gallons each, should be ordered and distributed. This is said to have caused considerable satisfaction among the people affected.

On the following day, "The Times" Correspondent reverted to the subject; the "persistent dissemination of sensational statements calculated to cause needless alarm" making it, he said, desirable to do so in the public interest. We again quote his remarks as coming from an impartial observer. He dealt specially with two statements—that the water is thick, muddy, and foul; and that a serious outbreak of disease has been caused by the deficient quantity and bad quality of the water. On these points, he said: "With regard to the quality, exactly the same charge was made last year in the same terms; but it was unable to face the ordeal of the Government inquiry, and was explicitly disclaimed by the Counsel who appeared for the aggrieved Vestries and consumers. This year I have endeavoured to discover if it has any foundation whatever. I have seen water drawn from a vast number of taps; and it has always been perfectly bright and of excellent quality. Except two or three persons, who failed to support their allegations by any evidence, all the people who were interrogated gave the water a good name." With respect to the alleged outbreak of disease, he said: "I have made careful inquiries in several East-end districts, and have found no evidence to show either that exceptional illness exists—exceptional, that is, for a hot, dry summer—or that such illness as there is has been caused by want of water. This charge also was made last year, and was supported by much medical evidence; but it completely broke down when critically examined by Dr. Barry, the Medical Inspector of the Local Government Board." The following additional remarks are worth placing on record: "The people in Limehouse are not suffering much, as a great many stand-pipes have been erected, and water can be obtained in abundance. It is being wasted so recklessly by stand-pipes and taps left open, that the Water Company would lose no more if they restored the constant supply. As to illness, they are rather 'slack' in their district. They have had no complaints. At Mile End, I made several attempts to see the Medical Officer, but without success. The Surveyor, however, informed me that nothing was known of any serious matter being reported; that they had no complaints; and that the water was being wasted. Of this I had abundant proof from my own observation. The continual waste going on all over the district is a mute, but absolute, refutation of the supposed existence of a famine." The Registrar-General's returns throw light on the question of the prevalence of disease. Taking Fulham, and comparing it with the Mile End, "The Times" correspondent gives the following figures showing the deaths from diarrhœa in the week before the curtailment of the supply, and the two subsequent weeks: Fulham, 21, 31, 13; Mile End, 12, 20, 10. It is therefore clear that in Mile End the week of greatest scarcity was only half as fatal as the preceding one.

Deputation to the President of the Local Government Board.

A numerous deputation, headed by Canon Barnett, waited last Friday upon the Right Hon. H. Chaplin, the President of the Local Government Board, to bring under his notice the condition of the people at the East-end, owing to the curtailment of the supply of water. With Mr. Chaplin were Sir Hugh Owen and Major-General Scott (the Official Water Examiner).

Canon Barnett said those present represented 1,250,000 inhabitants, who were dependent upon the East London Water Company for their supply. The greater number of the inhabitants occupied tenement houses, containing from one to four rooms. The people had been used to a constant supply, and had not the means of storing water nor the vessels necessary for storage, nor a suitable place in which to keep the water. The people, too, had not learned the habit of provision or organization. An intermittent supply meant that there was a great deal more waste than there should be. The disuse of water was not conducive to cleanliness, and there was naturally a danger arising of a very serious character. They had to thank Mr. Chaplin for the energy he had already shown in the matter; and they knew that, as a result, a better supply had been provided. They therefore had confidence that, with further energy, he would induce the Company to make the necessary provision which they ought to have done ten years ago. They were going to ask him to bring further pressure to bear upon the Company, so that the 3 million gallons of extra water they were obtaining from another Company, and what more they could get, should be utilized for the provision of a constant service. They would also ask that the supply might be provided to a height of more than 40 feet—a height reached by many of the houses in the district.

Mr. S. Buxton said that one practical proposal they had to make was that Mr. Chaplin should use his powers, assisted by the force of public opinion, to bring further pressure to bear on the Company to compel them, at whatever cost to themselves, to provide a larger supply of water for the districts. Not a gallon of the water they had obtained from the New River Company was, he said, being put into the pipes; it was being used to fill the reservoirs. He suggested that pressure should be brought to bear upon the Company to purchase water from other Companies sufficient to make the supply a constant one.

Mr. H. Ward complained that the water was supplied at insufficient pressure to reach the consumers' cisterns when they had them. He said that at the meeting recently held at Toynbee Hall, the following resolution was passed: "That as, during the intermittent supply, many houses get no water at all, this meeting urges the Government to introduce a Bill into Parliament, by which the exceptional powers of the East London Water Company can be modified and brought into conformity with the powers and obligations of the other London Water Companies. These exceptional powers are as follows: (*a*) The East London Water Company are not bound to deliver water more than 20 feet above pavement level at their ordinary scale of charges. (*b*) Under no circumstances are the East London Water Company bound to deliver water to a greater height than 40 feet above pavement, and even to that height only at an increased charge of 25 per cent." The East London Company complained, he said, of the "criminal waste," which, they contended, affected not only the quantity of water they supplied, but also the pressure. Parliament had given the sole authority for stopping this waste into the hands of the Company; it was a duty cast upon them. Could not the Local Government Board insist on them largely increasing their staff of inspectors?

Dr. T. Taylor, the Medical Officer of Health for Mile End Old Town, stated that the consequence of the short supply of water was that the emanations from the sewers and drains were becoming a source of danger to the health of the people. The general death-rate in his district, and also that for diarrhœa and gastro-enteritis, had increased considerably during the last fortnight—the period of the drought. Taking the two weeks previous to those of the drought, they had these statistics: Two weeks ending July 18: General death-rate for London, 21·6; for Mile End, 25·2. Diarrhœa and gastro-enteritis, for London, 1·6; for Mile End, 5·7. Two weeks ending Aug. 1 (the period of the drought): General death-rate for London, 24·8; for Mile End, 34·1. Diarrhœa and gastro-enteritis, for London, 2·6; for Mile End, 11·2. The absence of proper storage cisterns was a very cogent reason why they should have a constant supply. He had received a letter from the Secretary to the Water Company, stating that they were prepared to provide temporary storage vessels for poor residents who might be in distress. This letter showed distinctly that the Company did not realize the condition of things as they existed in districts like Mile End. Nearly two-thirds of the population would come under the term "poor residents;" and the proposal to his mind was quite impracticable. As an alternative, he suggested that more stand-pipes should be fixed. Of course, this would simply alleviate the inconvenience, and provide for domestic purposes. But, so far as sanitation was concerned, what was very urgently needed was a constant supply; and nothing short of this would meet the exigencies of the case.

Mr. Chaplin, in the course of his reply, said: When there were signs of a water famine in the East-end during last year, I had some opportunities of examining into the question for myself upon the spot. I think I obtained considerable insight into the question. Generally, I saw enough to fill me with sympathy for the inconvenience, and more than inconvenience, which a great many of the poorer inhabitants were put to by the prevalence of a water famine; and it has made me more than anxious to do all I can to prevent such an occurrence. I see no difficulty in agreeing to the first half of the first resolution which you passed at the Toynbee Hall meeting—viz., "That this meeting is deeply impressed with the evil effects of the short supply of water in the East-end of London." But when I come to the

second part of the resolution, which calls upon the Government to assist or to compel the Water Company to obtain sufficient water for the present needs of the district, then we stand upon a somewhat different footing. The reasons I will explain as briefly as possible. I have not waited for any deputation to do everything in my power to mitigate the difficulty of the present time; and I am grateful for the kindly words which fell from Canon Barnett in commending the efforts I have made. The moment I heard of the restriction which the Company thought proper to impose upon the supply of water, I put myself in communication with them; and though I am not here to defend them, it is only fair, in face of the hard things said about them, that I should state that the Company most readily responded to every suggestion I thought myself able to make. They took a very early opportunity, before receiving any communication from me, to erect stand-pipes where it was thought to be necessary. They have had a suggestion that these stand-pipes might be increased in particular places. The Company also made what arrangements they could with the New River Company for an increased supply of water. When two Companies are brought into negotiation together, it is not always easy to arrive at an instantaneous resolution of this kind. I am satisfied, however, that the East London Company made every endeavour to bring these arrangements to a quick conclusion. Last year, on the occasion of the drought, I personally inspected the area which was suffering, and a suggestion was made as to the supply of the means of storage. This, I am sorry to say, was considered impracticable. If, however, that system had been adopted, I feel there would have been a very sensible relief at the present time. But there are now no ready means available for stopping the suffering which prevails through a prolongation of the drought. I may refer to the practical proposition of Mr. Sydney Buxton, who urged that I should bring all this sort of thing to an end; that, at whatever cost to themselves, the Company should provide a greater supply than at present; and that I should insist upon them purchasing from the New River or the Grand Junction Company a sufficiency of water. To this he seemed to think there are no insuperable difficulties. I am afraid that is not quite the fact. The New River Company cannot supply more than they are doing at present without imperilling the position of their own consumers; and the main of the Grand Junction Company is now full, and cannot carry more than it is doing. Therefore, if the difficulty, which is apparent to everybody, and which we are all anxious to solve, is not surmounted with the rapidity and ease people seem to think it should be, it is because there are obstacles in the way which we have not been able to pass by. I wish to say a word about some of the statements which have appeared in the Press as to the effect of the restriction. No doubt, in the interest of the public health, what all of us wish to see is a constant supply restored at the earliest possible moment. But I am told of a great increase in sickness, and diarrhœa, and the death of a child directly attributed to it. I own this added a great deal to my anxieties. Yet, after careful consideration, I am bound to say that these statements have been exaggerated. We have no evidence that either the increase of sickness or the prevalence of diarrhœa is due to the restriction of the water supply. Similar allegations were made last year; and it was my duty to cause an inquiry to be held into the whole question. In their report, Colonel Ducat and Dr. Barry stated that there was no evidence to show that the scarcity of water had any precise deleterious effect upon the public health in the area of the East London Water Gompany. What is stated by these gentlemen is borne out in "The Times" of to-day. I had the figures verified, and I find they are absolutely correct. They certainly do show, in the case of Mile End, what was the position of affairs after three weeks had elapsed since the scarcity of water began. In the first week, there were 12 deaths; in the second, 20 deaths; and in the third, only 10. There has been actually a falling off in the number of deaths from diarrhœa as compared with the preceding weeks. Diarrhœa is always prevalent at this time of year; and no one can say it is entirely due to the want of the usual supply of water. With regard to the alleged death of a child from diarrhœa, caused by the deficient supply of water, I made inquiries from the doctor mentioned—Dr. Cooper Harrison—and from the Water Company; but I have not received a reply from the medical man. The Company, however, have made this statement: "With respect to the alleged prevalence of diarrhœa, the Medical Officer of the district expresses surprise at the evidence, and says that, as far as his experience has gone, the restricted supply of water has not effected the result described in the evidence of that particular case at the inquest. I feel that it is not possible to attribute illness or death to the want of water; but the prevalence of diarrhœa may be owing to the absence of moisture in the air." As to the second part of the resolution, it is beyond my power or that of any human being. What are the causes of the difficulty? Let us look the matter in the face. In the first place, it is due to a drought following upon another year of drought —worse, I am told, than any drought for the past sixty or seventy years. Then it is due to the absence of storage and the want of cisterns in the houses. It is not in my power to compel the rain of heaven; but with regard to the second cause, there I do think it is only fair I should say a word. Canon Barnett has blamed the Company for not acting ten years ago. But suppose they had acted ten years ago, and Parliament had done the same as it did in 1893, how would the Company have been regarded? If there is to be blame for the present deficient supply of water to the poorer inhabitants of London, then, in plain terms, let the blame rest upon the shoulders which ought to bear it, and are at present responsible—upon the shoulders of those who took the action to prevent the passing of the Company's Bill in 1893, warned as they were by Mr. Mellor, the Chairman of the Committee of Ways and Means, of what the consequences would be. With these circumstances before us, and the report of the gentlemen last year, there can be no other responsibility due, for the increased means of storage would have been completed by this time; and I am advised that there would have been a constant supply even now, and that the present difficulties would not have arisen at all. The next recommendation is this: Mr. Ward and also Canon Barnett propose that legislation should be introduced as speedily as possible to remove the exceptional privileges enjoyed by the East London Water Company; that they alone among the Water Companies are not compelled to supply water up to a height of 40 feet. I am told that the difficulties of getting the necessary pressure to supply water to that height are exceptional. But that is a matter which relates to future legislation, and is not one of momentary urgency; and it cannot be carried out without an Act of Parliament. I will carefully examine the suggestion, in connection with any Bill or Bills or measures proposed to Parliament. We are all agreed that there ought to be an adequate supply of water, and that it should be rendered again constant at the earliest possible moment. The immediate question is how to bring about the constant supply as quickly as possible. You will have clearly perceived, from what I have said, that the question is full of difficulties. It is not a matter within my absolute control; but it requires every effort and exertion, not only on the part of the Company, but on that of the consumers, who would do well to avoid waste as far as possible. But of this you may be assured, that, as far as any efforts of mine can bring it about, nothing shall be wanting on my part to secure a happier condition of affairs for the unfortunate poor of East London.

The deputation thanked Mr. Chaplin for the kind manner in which he had received them, and then withdrew.

BRITISH INSTITUTE OF PUBLIC HEALTH.

The Annual Congress in Glasgow.

The Congress of the above-named Institute, the opening of which in Glasgow has been already mentioned, was continued on the 24th ult., under the presidency of the Lord Provost (the Right Hon. Sir J. Bell). Three papers read in the Chemical and Engineering Section, the President of which is Professor W. Ramsay, call for brief notices.

Dr. J. B. Readman, of Edinburgh, dealt with the subject of "The Treatment of Peaty Water in a Reservoir." He said that the treatment to be described was well known; but what was possibly new was the attempt to purify water highly coloured by peat in a large public reservoir while an extensive population was being provided with water. Last year, a large reservoir, occupying 113 acres, was constructed by the County Council of Linlithgow. It was situated on the high ground about two miles on the main line between Airdrie and Bathgate, and was about 1500 yards long. The Forrest Burn ran through it; and the catchment area was large. It was found necessary to deepen the reservoir, and to cut through peat. When water was introduced in June last, it was highly coloured, and the people declared it undrinkable. Samples were sent to the author for analysis; and, after some trouble, he was allowed to make an experiment. He gradually introduced alum at different points, and soon found that its action was to precipitate brown peaty matter; and in a very short time the water was so clarified as to be even clearer than that supplied to the city of Edinburgh. About 60 tons of alum had been employed to bring about this result; and it might be found necessary, under certain conditions, to add a little alum at different times.

Mr. A. E. Fletcher, the late Chief Inspector under the Alkali Acts, read a paper on "The Pollution of the Atmosphere by Coal Smoke." He referred to the evils arising from smoke—these having, he said, become almost unbearable as cities had grown larger; and a demand was now made that every effort should be put forth to prevent the pollution of the air. He contended that smoke was injurious to health and comfort, and was becoming a nuisance. It had also a great effect on social evils, because the artisans were compelled to live near their work, while the employers could go away to the country; and the separation thus caused must have a bad effect on society. Smoke was due to the factory furnaces and to domestic or house fires; and it was caused by the chilling of the gases. Reference was made to the numerous forms of apparatus experimented with for the prevention of smoke now called for by the public. Both in England and Scotland, Committees had made experiments in the direction of attaining this end. They had shown that the prevention of smoke was possible; and he was hopeful that much good would result from these labours in the removal of the smoke in our large towns, rivers, and lochs. He further believed that the time had come when the administration of the law in reference to this matter would be placed under the control of a central authority, and that Government inspectors should be appointed to see to this being carried out. Turning to the prevention of domestic smoke, he advocated coke-stoves, and also suggested the heating of houses by hot-air stoves in the basement; and he advised that cooking should be done by gas.

In the discussion upon the paper, Mr. Crum remarked that in January last year he suggested the appointment of a Municipal Committee. Owing to the heavy loss which the continuation of smoke caused, he considered it was surely not too much to urge upon the Municipality to discharge for the citizens the duty of purification of the air, as they had already so efficiently dealt with the purification of the water, the streets, lanes, and houses. He was sure any money wisely employed in the attainment of so desirable an end would never be grudged by the citizens. Mr. Hopkinson, of Lancashire, asked if the fumes from a coke fire would not be detrimental to health. Mr. Crum stated that in their works at Thornliebank they burned about 140 tons per day, and had really no smoke from their chimneys. Ex-Lord Provost J. Ure said he had two mills, one of which was dealt with on the principle of hand firing and the other by automatic stokers; and he frankly confessed that careful hand firing seemed to him to be about as useful in the matter of overcoming smoke as the automatic stokers. The latter gave more freedom in the way of using an inferior quality of dross; but to that extent he believed there was much more in hand firing. He had long had the idea that if there was a wholesome public opinion, and that if those who had large chimneys emitting smoke felt they were doing a wrong to their fellow-citizens, they would have very much less smoke. He had also found that what was of far more consequence than any threat of being brought before the Police Court was that of giving a little to the stoker. Dr. Macadam, of Edinburgh, speaking with reference to households, said he believed that a little more care in dealing with the fires in parlours and dining-rooms would be of greater use than any prosecutions in respect of large chimneys. Mr. Fletcher, in replying to the discussion, said it was like flogging a dead horse to speak about the methods of preventing smoke. It was

now known that smoke could be prevented; and it was for the public to say that it must cease. The President said it appeared to him that the question of smoke prevention in factories would cure itself. It was more difficult to deal with domestic consumers, as so many of them were scarcely able to afford any expenditure whatever, and were so little amenable to reason. He was in favour of the open fire; and if a fuel could be obtained which, without being too expensive, would do away with smoke, this would only require to be stated to spread its use abroad. But, after all, some preventive legislation was needed to get in the thin end of the wedge.

Mr. J. M. RONALDSON, H.M. Inspector of Mines, read a paper on "Ventilation, with Especial Reference to its Industrial Aspects." In dealing with his subject, Mr. Ronaldson showed how important it is that all workpeople should be provided with pure air, both in their dwelling-houses and places of employment; and suggestions were given as to how churches, halls, dwelling-houses, &c., should be heated and ventilated. It was surprising, he remarked, to find that most of our dwelling-houses, churches, &c., were so constructed that proper ventilation was not practically attained. In cold weather, the entrance of fresh air was carefully prevented; and rather than endure cold draughts, most people preferred to put up with inadequate ventilation. To properly ventilate halls and churches, it was recommended to adopt a forcing-fan driven by electricity, water, gas, or an oil engine, with large and numerous branch pipes led into the building, and with ample area in the outlet-pipes in the roof. To avoid draughts, when necessary the air should be heated previous to its entry, by passing over coils of hot-water pipes. In warm weather, it could be cooled by passing over blocks of ice. It might also be purified by passing through a water-spray or suitable filter. By such a system, there was at command a constant ventilating power which could be altered at will to meet varying requirements. In the case of blocks of buildings, one fan could be fitted up, with branch pipes led to all the rooms, and similar pipes carried from the ceilings for the exit of the air into the chimneys, or main outlet-pipes led up through the roof. For cooking purposes, it would be more economical and convenient to substitute gas-stoves, from which the products of combustion would be forced by the fan directly into a ventilating-flue. The proprietor would have the ventilating and heating of the whole property in his own hands; and if separate accommodation were provided for washing and drying clothes, the tenants would find it an advantage to pay extra rent for the expense of heating and ventilating. It was claimed that by such a system there would accrue many advantages. The price of the coal consumed, together with the expense of the power for driving the fan and the gas used by the cooking-stoves, would not equal the cost of the coal that otherwise would be burnt in ordinary fires for warming and cooking purposes; the labours of the housewife would be considerably reduced; less smoke would be poured into the air; and each family would be living comfortably in an atmosphere at all times closely approximating in purity that surrounding their dwellings.

Reduction in Price.—In view of the satisfactory profit made in the past year, the Gas Committee of the Middleton Town Council have decided to reduce the price of gas by 3d. per 1000 cubic feet for lighting purposes only. The Ashton-under-Lyne Gas Company have given notice that the price of gas has been reduced to 2s. per 1000 cubic feet from the making up of the books for the June quarter. The rebate is equal to 4d. per 1000 feet.

New Pipe-Lines for the East Jersey Water Company.—The East Jersey Water Company have completed, from Macopin intake to Pompton Notch, the laying of their duplicate 48-inch riveted steel pipe alongside the original 48-inch pipe from Macopin intake to Newark and Jersey City. Pompton Notch is the highest point on the line between the intake and the city distributing reservoirs; and to increase the flow through the lower portion of the old pipe, the new and old pipes were connected at this point, and water turned into the new pipe at the intake. This had the effect of increasing the flow through the lower portion of the original pipe from 35½ million to 46 million gallons daily. It is expected to complete the second pipe-line in a few months, and have a supply of 70 million gallons of water daily.

Sick Club of the Leicester Gas Department.—The seventh annual meeting of the Sick and Funeral Allowance Society connected with the Leicester Gas and Electric Lighting Works was held on the 28th ult. Mr. A. Colson, the Engineer to the Department, presided. The annual report showed that the number of members is 549. During the past twelve months, the total receipts were £519 16s. 4d.; while £341 3s. 8d. was paid to sick members, and £52 for the funeral allowances of four members and five members' wives. The total expenditure was £431 8s. 8d.; and the balance in hand is £593 8s., or a gain of £88 7s. 8d. on the year. It was decided to subscribe £5 5s. annually to the Devonshire Hospital and the Buxton Bath Charity; and among the votes of thanks was one to the Gas Committee for their donation.

Chesterfield Gas and Water Supply.—Circulars have been issued to the householders of Chesterfield by the Gas and Water Board relative to the present position of the Board and their ability to serve the consumers of gas and water. The Board state that they are able to supply gas in greatly increased quantity, because of the preceding Board having erected a plant capable of manufacturing gas largely in excess of the requirements of the town and district. From July 1, the price of gas has been reduced from 4s. to 3s. 6d. per 1000 cubic feet for gas used for lighting purposes. To consumers of 200,000 cubic feet and not more than 300,000 feet per annum, a discount of 5 per cent. on this price is to be allowed; and to consumers of more than 300,000 feet per annum, a discount of 7½ per cent. In order to promote day consumption, all gas for cooking, heating, and motive power will, if passed through a separate meter, be subject to a 5 per cent. discount for a quantity under 300,000 feet; and if above that quantity, a deduction of 10 per cent. on the new standard price will be conceded. With reference to the Water Department, the Board impress upon customers the great necessity for economy. Additional works are being carried out to enable the Board to distribute the water. But before these are fully employed, some time must elapse; and meantime the signs of a prolonged drought are abundant.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Paisley Corporation Gas Committee have now issued their report for the year ending May 28 last. In addition to what I have already given, I observe that the consumption of gas amounted to 274,396,000 cubic feet, and that unaccounted-for gas amounted to 12·67 per cent. There was an increase of 18,854,000 cubic feet of gas sold—a very satisfactory record. Of the total revenue of £40,185, there was derived from the sale of gas £33,515, from residual products £4313, and from coke £1494. Manufacture cost £15,979, of which £13,814 was for coal. Purifying materials cost £401; wages of workmen at works, £4987; and repairs and maintenance of works and plant, £2618. There was an extraordinary expenditure, for extensions and the like, amounting to £597. A sum of £5921 was last year voted to the Town Council for improvement purposes. Had it not been for these two items, it would have been possible to have sold gas at 2s. per 1000 cubic feet; and when it is remembered that the gas which Mr. Hislop supplies is of 27-candle power, it is apparent that, but for the much-to-be-deplored practice of saddling the gas undertaking with burdens not its own, Paisley would occupy the position of having, relatively, the cheapest gas in the United Kingdom. This is an encouraging position to occupy. The smallness of the amount required to provide purifying materials is noteworthy. I have calculated the proportion; and find that it amounts to 1-34th of the cost of coal. I have also ascertained that the proportion in another of the large gas undertakings in Scotland, is 1-21st of the cost of coal. That is to say that, in the same proportion, Mr. Hislop's purifying materials would have cost him £257 more; and in the other works, on the same proportion as in Mr. Hislop's case, the cost of purifying materials would have been £1544 less. It is well known that Mr. Hislop is the inventor of an apparatus for the recovery of spent lime; and these figures show the value of the arrangement.

The report of the Kilmarnock Corporation Gas Committee for the year ending June 14 shows that there was an output of gas amounting to 99,206,700 cubic feet, which was an increase upon the quantity in the preceding year of 8,332,700 cubic feet. The gross revenue amounted to £15,632, and the gross expenditure to £12,665; leaving a profit for the year of £2967. A sum of £8540 was brought forward from the preceding year; and out of the product (£11,507) there was paid for extensions £707, and there was contributed to the sinking fund £700; and £10,089 is to be carried forward. The sum received for gas amounted to £13,506. This was the largest amount the Corporation ever received under that head; the next largest having been in 1894, when the price of gas, which is now 3s. 1½d., was 3s. 4d. per 1000 cubic feet, and when the revenue from gas was £12,256. The quantity of coal carbonized was 10,008 tons—an increase of 758 tons, due to the larger output of gas; and the price paid for coal was £5504, or £335 less. The yield of gas per ton of coal carbonized was 9600 cubic feet—an increase of 100 cubic feet per ton upon the quantity in the year preceding. Unaccounted-for gas amounted to 10 per cent., or 2 per cent. less than in the preceding year. The tar produced amounted to 151,840 gallons—an increase of 9862 gallons; and the revenue under this head was £851—an increase of £26. There was an average production of tar equal to 15¼ gallons, as compared with 16 gallons in the preceding year. The production of sulphate of ammonia was 103 tons—an increase of 5 tons; and the revenue was £910, or £132 less than in the preceding year, the average price received having been £1 16s. per ton less. In an interesting analysis which is given, it is shown that the expenditure per ton of coal carbonized amounted to £1 11s. 2·84d., as compared with £1 10s. 10·01d.; and that the expenditure per 1000 cubic feet amounted to 3s. 2·85d., as against 3s. 2·93d. I must again compliment the Manager (Mr. W. Fairweather) not only upon the very successful year he had, but also upon the lucidity with which his accounts are stated. The whole report is a model one.

The Gas Committee of the Dundee Corporation, who are also the managers of the electric lighting undertaking of the Corporation, had under consideration on Tuesday the question of the cost of public lighting by electricity. Views were expressed to the effect that the lighting was far from being sufficient, looking to the cost. A remit was made to the interim Electrical Engineer to report on the cost, and state whether the electric lamps should be dispensed with or improved. He was also instructed to report with reference to the electric lighting of public lamps in other towns. A report was also submitted by the interim Engineer on the lighting area. He said the present lighting system was installed over three years ago, when plant for supplying 10,000 lamps was put down. At present there were about 17,000 lamps connected with the mains. During the present year, additional lamps had been connected; so that heavier mains were most urgently required to cope with the demand. Under existing circumstances, it would not be possible to keep within the limit prescribed by the Board of Trade. He would recommend that the Overgate and Whitehall Street mains, which were overloaded, be also attended to. Inquiries had been made for supply in Dock Street and South Tay Street, in neither of which thoroughfares were there mains laid, though they were within the area of supply. He would urge that all further supplies be given at a pressure of 200 volts. This would be a great benefit to them; and would result in a saving of from 20 to 30 per cent. of copper on any further extension. By adopting 200 volts as the standard pressure for future supplies, the work of changing over to the three-wire system would be greatly simplified. The proposed increase of mains would mean a total cost of somewhere about £1047. The Committee sanctioned the extension proposed by the Engineer.

The Fort William Gas Company have done their best to give electric lighting a very good advertisement. For nearly a year their gas supply has been very irregular; and, indeed, on several occasions it failed altogether. Chiefly on account of the unsatisfactory nature of the gas supply, a limited liability company was formed locally, with

a capital of £7000, for the introduction of an installation of electric light. This work has now been almost completed; and a preliminary test of the light was made on Monday night. Strange to say, on that, as well as on the preceding night, the gas supply failed, throwing the place into darkness. The power for generating the electric current is obtained from two turbine wheels working with a fall of 120 feet; and the current is conveyed by overhead wire. It is proposed to supply it at 150 volts, and to charge 9d. per unit.

The Bridge of Weir (Renfrewshire) Gas Company has this week been registered as a limited liability company, with a capital of £5000 in shares of £1 each. The registered office is at the Gas Office, Bridge of Weir; and Mr. Peter Woodrow is Secretary.

The Carluke Gas Company had last year an increased output of gas of about 400,000 cubic feet. They have paid a dividend at the rate of 6s. per share, and have reduced the price of gas by 5d. per 1000 cubic feet, making it 3s. 4d.

The Gas Committee of the Corporation of Glasgow have resolved to reduce the price of gas by 1d. per 1000 cubic feet, making it 2s. 3d., which is the lowest price at which gas has ever been sold in the city. A year ago a reduction of 2d. was made, which meant a saving to gas consumers of between £30,000 and £40,000.

The East Kilbride Gas Company have just closed one of the most successful years they have ever experienced. A dividend at the rate of 5 per cent. has been paid; and the price of gas has been reduced from 5s. 10d. to 5s. per 1000 cubic feet.

At present there is some trouble in connection with the Dumfries Corporation Gas Supply, arising out of the circumstance that a well in the works of the Tanneries Company, adjoining the gas-works, is being polluted. From the nature of the pollution, the Tanneries Company conclude that it is tar from the gas-works which is finding its way into the well. The theory is a plausible one; but it is still only a theory, for though Mr. Malam, the Gas Manager, has during the past six weeks expended £25 in digging with a view to discovering if there was an escape of tar from his works, nothing has been found. The suggestion has been made that the Gas Committee should put down an artesian well which would supply both the Tanneries Company and the gas-works. Apart from the question of liability for the present condition of the well, it is argued that to put down a new well would be a saving. Its cost, it is estimated, were it sent down 300 feet, would be about £150; and at present the annual charge for water for the gas-works is £50. The Town Council, at a meeting held on Thursday, instructed Mr. Malam to procure as soon as convenient fuller information as to the cost of sinking a well, and of providing storage accommodation.

The last report by the Glasgow Gas Corporation Treasurer on the gas-stove department states that up to date there had been sold 19,438 gas-stoves, range-fittings, and other heating appliances; and that at the same time the stoves and range-fittings on hire and in use amounted to 12,678.

The Grangemouth Gas Company have given notice that, as from May 15 last, the price of gas will be 3s. 6d. per 1000 cubic feet, instead of 3s. 9d

At a recent meeting of the Glasgow Corporation Committee on Gas-Works there was brought up for consideration a proposal to extend the chemical works connected with the Dawsholm Gas-Works, which have for some time past been tenanted by a firm of tar distillers. The Committee, after visiting and inspecting the works, agreed to recommend that they should be remodelled and extended in conformity with a plan submitted to them by Mr. Foulis, at an approximate cost of £5000 —that sum to include new storage tanks, boilers, coolers, and an extension of the existing railway sidings, upon condition that the lessees agree to pay interest at the rate of 7½ per cent. per annum during the currency of their lease upon the total amount to be expended by the Corporation. The same Committee also had under consideration an application for the lessees of the chemical works in West Street adjoining the Tradeston Gas-Works, as to providing a new tar-still, pitch-bed, and cooling-tank at the works; and they agreed to recommend that these should be fitted up by, and at the expense of, the Corporation, on condition that the lessees agree to pay interest at the rate of 7½ per cent. per annum during the currency of their lease upon the amount to be expended by the Corporation. They likewise resolved to recommend that a set of Claus's sulphur-recovery plant should be fitted up at the chemical works recently acquired from Messrs. James and Co.; for the purpose of putting these works in such a condition as to enable them to be registered under the Alkali Acts, provided that the lessees also agree to pay interest at 7½ per cent. per annum on the cost of the plant during the currency of their lease. A few days ago the Committee were informed that the respective lessees had consented to the terms specified; and they accordingly gave authority for the extensions and improvements to be proceeded with at once.

Sulphate of ammonia is reported to have been selling yesterday at nearly as low as £7 10s. per ton, which is £6 per ton less than the price which was obtained for it two years ago.

A question was raised in the Aberdeen Town Council on Monday as to the purity of the water supplied to the city. Mr. Gray, who introduced the subject, said that the filters which were formerly used had been dispensed with, and the water was now being sent into the city direct from the River Dee. He had found reptiles in the water; and now he never allowed water to be used unless it were first filtered. He moved that an analysis of the water be obtained. There was considerable discussion over the proposal; there being some who objected to a slur being cast upon the town water supply. It was felt, however, by most of the councillors that, after what Mr. Gray had said, it would be advisable to have a fresh analysis of the water made. The Water Committee were instructed to obtain a report on the condition of the water from a reliable analyst; and also to report on the probable cost of obtaining a periodical report on the condition and quality of the supply.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 256).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	25½–26½	..	3 19 3
100,000	10	,,	7½	Do. 7 p. c.	18–19	..	3 18 11
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	108–110	..	4 10 11
00,000	10	12 June	5	Belgrano (B. Ayres), Limited	10–10¾	..	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅞–8¼	..	3 18 9
40,000	5	,,	6½	Do. New, £4 paid	5½–6	..	4 6 8
380,000	Stck.	27 Feb.	12	Brentford Consolidated	290–295	..	4 1 4
210,000	,,	,,	9	Do. New	220–225	..	4 0 0
50,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
159.375	,,	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	27 Mar.	11	Brighton & Hove Original	247–252	..	4 7 3
208,820	,,	,,	8	Do. A Ord. Stk.	190–195	..	4 2 0
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	127–132	..	3 15 9
420,000	20	27 Mar.	11¼	British	57½–58½	+½	3 16 11
50,000	10	12 Mar.	11½	Bromley, Ordinary 10 p. c.	22½–23½	..	4 17 11
71,000	10	,,	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	10¼–10¾	..	4 13 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	102–105	..	5 14 3
150,000	20	15 July	8¼	Cagliari, Limited	29–31	..	5 6 5
100,000	10	29 May	8	Cape Town & District, Ltd.	16½–17½	..	4 11 4
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60	..	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	345–350	+2	3 17 2
165,000	,,	,,	10½	Do. New do.	260–265	+2	3 19 3
165,000	,,	12 June	4½	Do. 4½ p. c. Deb. do.	149–152	..	2 19 2
800,000	Stck	12 June	13	Continental Union, Limited.	285–290	..	4 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
157,500	,,	,,	11	Do. B 7 p. c.	—	..	—
535,000	Stck.	27 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	140–144	+2½	3 12 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	15 July	11	European, Limited	26½–27½	..	4 0 0
354,060	10	,,	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,746,590	Stck.	13 Feb.	12¾	Gaslight & Coke, A, Ordinary	320–325	..	3 18 11
100,000	,,	,,	4	Do. B, 4 p. c. max.	110–115	..	3 9 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	305–315	..	3 3 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	215–220	..	3 8 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	208–213	..	3 5 9
463,000	,,	,,	10	Do. I, 10 p. c. Prf.	305–315	..	3 3 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	175–180	..	3 6 8
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	138–143	..	2 15 11
294,850	,,	,,	4½	Do. 4½ p. c. do.	153–158	..	2 16 11
908,000	,,	,,	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	14 May	6	Hongkong & China, Limited	12½–13½	..	4 8 10
3,800,000	Stck.	14 May	12	Imperial Continental,	253–258	..	4 13 0
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100–103*	+2	3 17 8
473,600	Stck.	13 Feb.	3½	Do. 3½ p. c. Deb. Stk	110–112	..	3 2 6

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115–118	..	4 4 10
250,000	100	,,	4½	Do. 4½ p. c. Debs.	110–112	..	4 0 4
541,920	20	12 June	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8¼–8¾	..	4 11 5
135,000	5	,,	8	Do. New, £4 10s. paid	7¼–7¾	..	4 12 10
15,000	5	,,	8	Do. do. 1879, £1 paid	1¾–2	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	1 May	6	People's Gas 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	1 June	6	of Chicago 2nd Do.	102–107	..	5 12 1
250,000	10	27 Mar.	8	San Paulo, Limited	13½–14½	..	5 10 4
500,000	Stck.	13 Feb.	15½	South Metropolitan, A Stock	423–428	+10½	3 12 5
1,350,000	,,	,,	12	Do. B do.	330–335	+7½	3 11 8
340,000	,,	,,	13	Do. C do.	352–357	+9¾	3 12 10
820,000	,,	15 July	5	Do. 5 p. c. Deb. Stk.	173–176	..	2 16 10
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250–255	..	4 10 2
60,000	,,	,,	8½	Do. B	—	..	—
170,380	10	29 May	10	Tuscan, Limited.	13¾–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	98–100	..	5 0 0

WATER COMPANIES.

746,123	Stck.	26 June	10¾	Chelsea, Ordinary	345–350	..	2 18 7
150,000	,,	,,	5	Do. 5 p. c. Pref.	175–180	+5	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	,,	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	158–163	..	2 15 2
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	235–240	–2	2 18 4
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	156–159	..	2 16 7
100,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105–107	+1	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	122–126	–1	2 19 6
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	149–153	..	2 12 4
708,000	Stck.	13 Feb.	12	Kent	352–357	..	3 7 3
160,000	,,	,,	7	Do. New, 7 p. c. max.	222–227	..	3 1 8
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	270–275	..	2 14 6
406,200	100	,,	7½	Do. 7½ p. c. max.	227–230	..	3 5 2
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	147–152	..	2 12 8
500,000	100	13 Feb.	12¾	New River, New Shares	439–444	..	2 17 6
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	157–160*	..	2 10 0
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	154–159	–3	2 10 4
126,500	100	,,	4	Do. Do. 7½ p. c. Max.	150–155	..	2 11 7
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	172–177	..	2 16 6
1,019,585	,,	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	153–156	+5	2 11 3
1,155,066	Stck.	12 June	10	West Middlesex	328–333	..	3 0 0
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	157–162	..	2 15 6

*Ex div.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 8.

Sulphate of Ammonia.—The month of August has brought no improvement in the market; the tone being, in fact, rather easier on the week. There is still great scarcity of consumers' orders; the buying being mainly by speculators, who—being able to wait an opportunity—seem in no hurry to cover their August requirements. Scotland is still the weakest point; for, although makers are still asking £7 15s., second-hand parcels have been changing hands at £7 12s. 6d. f.o.b. Leith. The quotations f.o.b. at the English ports are £7 15s. to £7 17s. 6d. Operators, calculating no doubt upon the large Scotch summer production being sufficient to fill all likely requirements until the heavy production in England is available, are offering freely up to the end of the year, and even into next year, at a trifling premium on spot prices. Buyers in the main, however, still hold aloof.

Nitrate of Soda is quiet on spot, at 8s. for fine quality.

LONDON, *Aug.* 8.

Tar Products.—There has been considerable animation in this market during the past week. Benzols have been in strong demand; and in one case as much as 3s. 9d. has been paid for 90's. There is now some scarcity of solvent naphtha; and, from appearance, makers seem to be oversold. From France, the demand for solvent naphtha is better than it has been for some time. Carbolic acid is moderately steady; but there is no pressing inquiry, while crystals are out of parity with crude. The tendency is to somewhat lower prices, in both cases. Pitch is a little firmer; but, so far, buyers will not advance beyond 32s. at the best ports. Anthracene is reported to be a little more active; but no business of importance is noted. In one or two instances, where tar is rich in benzol, especially in the Lancashire district, high prices have been paid for it. Prices ruling there, owing to the advanced values of benzols, are no index as to the value of tar on the east and south coasts, where, in some instances, not a particle of benzol exists in the tar made; gas engineers being too wide awake to leave much of this precious article in the tar.

Business during the week has been noted at the following rates: Tar, 19s. to 28s. Pitch, 32s. Benzols, 90's, spot, 3s. 9d.; forward, 3s. 6d.; 50's, spot, 2s. 9d.; forward, 2s. 6d. Toluol, 2s. 3d. Solvent naphtha, 1s. 4½d. Crude, 30 per cent., naphtha, 1s. Creosote, 1½d.; fluid, 2½d. Naphthalene, pressed, 65s.; salts, 32s. 6d. Cresylic acid, 1s. Carbolic acid, 60's, 2s. 1d. Anthracene, "A," 10½d.; "B," 8½d.

Sulphate of Ammonia shows no improvement; and buyers are taking advantage of the present demoralized condition of the market, and offering very low figures. Transactions have been reported at £7 11s. 3d. northern ports; while quotations for eastern, southern, and western ports are £7 15s. to £7 17s. 6d. less 3½ per cent. Gas liquor, 6s. to 7s. per ton.

COAL TRADE REPORTS.

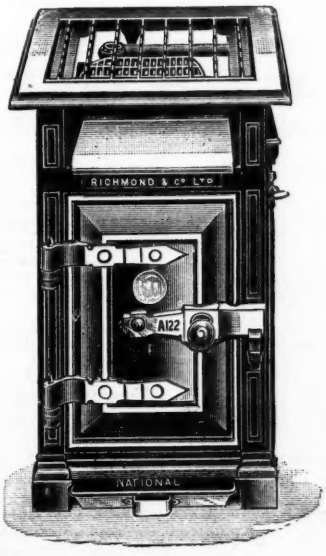
From Our Own Correspondents.

Lancashire Coal Trade.—As anticipated last week, the altogether groundless excitement over the collapse of the Conciliation Board is already rapidly disappearing. In fact, during the past week there has been a general decided slackening off in orders for all descriptions of fuel—so much so, that many of the collieries have not been running more than three to four days. Some of the collieries are kept fully going with orders booked last month; but generally all classes of round coal are beginning to hang, and from outside districts surplus supplies are being pushed here at very low figures. At the pit mouth, prices may now be quoted at 9s. 6d. to 10s. for best Wigan Arley; and 8s. to 9s. for Pemberton four-feet and seconds Arley.

Northern Coal Trade.—There has been a continuance of the increased demand for coal. The collieries have not only been able to have full time, but they have also with longer turns held more steadily to their prices; and in one or two cases have been able to command a slight increase. In gas coals, the demand is increasing, both for local consumption and also for shipment; but the business is mainly on contracts that have been made some time. For occasional cargoes, the quotation may be put as about 6s. 6d. per ton f.o.b. for best Durham gas coals. Gas coke is in a little better demand. But the production is now increasing with every week; and unless the sales be enlarged, stocks will grow at some of the inland works. At the gas-works on navigable waters, there is a probability of larger exports, so that stocks may be kept down.

Scotch Coal Trade.—There is a better demand for coal, and a decided hardening of prices for some sorts. Ell has advanced, and so has main. Splint is plentiful, and is realizing late rates. The men are working contentedly all the time they can get. The prices quoted are: Main, 5s. 9d. to 6s. per ton f.o.b. Glasgow; ell, 6s. 6d. to 7s.; and splint, 6s. 6d. The shipments for the week amounted to 177,311 tons—an increase when compared with the preceding week of 41,148 tons, but a decrease on the corresponding week of last year of 15,960 tons. For the year to date, the total shipments have amounted to 4,311,618 tons—an increase over the same period of last year of 206,072 tons.

Hydraulic Stoking Machinery for America.—Mr. M. S. Greenough, of the Cleveland Gas-Works, Ohio, has just placed an order with Sir William Arrol and Co., of Glasgow, for some of their hydraulic drawing-machines, which he is about to introduce into his works in America. Between forty and fifty of the Arrol-Foulis rakes and chargers are now in course of construction for various gas-works, both in this country and abroad, besides a large number of coal-breakers, elevators, and other accessories, all of which are required by the commencement of next winter.



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Barry Gas and Water Works Extensions.—The Gas and Water Committee of the Barry District Council, at their meeting on the 24th ult., received a communication from the Local Government Board, granting power to borrow two sums of £550 and £473 respectively for the purpose of new works; and details were also reported with regard to an inquiry recently held by Colonel J. T. Marsh, concerning an application to the Board for power to borrow further sums amounting to £29,000, to cover the estimated capital expenditure to March, 1898.

Proposed Purchase of Lancashire Gas Undertakings by Local Authorities.—At the last meeting of the Westhoughton Council, a communication was read from the local Gas Company, in reply to one asking if the Directors were willing to negotiate for the sale of their undertaking. They said that, while the Company had no wish to sell their works, if the Council desired to purchase, and would make a reasonably satisfactory offer, they would have pleasure in placing it before the shareholders. It was decided to inspect the works, with the view to making an offer for the undertaking. There is a proposal on foot for the purchase of the Ramsbottom Gas-Works by the District Council. Matters have progressed so far that the Gas Company have been asked to fix a specific sum which will be accepted; and a Sub-Committee of the Council has been appointed to negotiate with the Company.

Strike at the Lisbon Gas-Works.—At one o'clock on the morning of Sunday, the 2nd inst., all the gas-lights in Lisbon went out suddenly in consequence of a strike at the gas-works. It appears that the men sent in a demand for the dismissal of the foreigners employed by the Company; and this not being conceded, they stopped work. On Monday night the streets were in complete darkness; and work was suspended in numbers of factories and places where gas-engines are employed. In consequence of the contracts existing with the theatres gas was reserved for those houses at which performances were given; but petroleum and Chinese lanterns were being made use of in the theatres, *cafés*, and shops. On Wednesday, the strike was still going on; but with the aid of troops and marines the fires at the works were kept up, and the lighting of the streets was improving. It was decided that, if the old firemen did not return promptly, a sufficient number of foreigners, who had already arrived—including Englishmen, Frenchmen, and Belgians—would be taken on to keep the works going; and new men would be engaged to light the street-lamps.

The Gas-Works Purchase Question at Ashford.—Last Thursday, in accordance with a formal requisition, a meeting of the ratepayers and owners of property within the Ashford urban district was held in the Corn Exchange, to sanction the promotion of a Bill by the Urban District Council to authorize them to supply gas, and to provide for the transfer of the undertaking of the Ashford Gas Company to the Council. The Chairman of the Council (Mr. W. G. Handcock, J.P.) presided; and among those present were Mr. J. Morton and Mr. H. J. Bracher, the Manager and the Secretary of the Company—the latter gentleman representing certain ratepayers. Mr. Spalding attended for the Rating Department of the South-Eastern Railway Company. The Chairman was about to put the necessary resolution, when Mr. Spalding attempted to speak; but he was not allowed to do so. The formal motion was then submitted, and received with prolonged applause. It was seconded by Mr. G. A. Spain, the Vice-Chairman of the Council. Mr. Bracher here endeavoured to address the meeting; but he was not more successful than Mr. Spalding. Not being himself a ratepayer, he was refused a hearing on behalf of those who were. The resolution was carried by a large majority. Amid some excitement, in which protests were heard against the way in which the proceedings had been conducted, a poll was demanded; but as this was done after the meeting had closed, it will not take place.

Additional Capital for the Lambeth Water Company.—The Directors of the Lambeth Water Company have been authorized to issue the whole or part of the £490,000 of redeemable debenture stock sanctioned by their Act of the present session. It will come under the operation of the sinking fund clause, and bear interest at such uniform rate as the Governor for the time being of the Bank of England, or some person to be nominated by him, shall determine.

Plymstock Water Supply.—The Plympton District Council have approved of the plans prepared by Mr. H. Francis, Assoc.M.Inst.C.E., of Devonport, for the water supply to the parish of Plymstock; and application is to be made to the Local Government Board for the necessary loan. The following villages are included in the scheme: Elburton, Plymstock, Higher Hooe, Hooe, Oreston, and Turnchapel. The works proposed include a covered service reservoir to contain 100,000 gallons, and about 9 miles of mains. The estimated cost is £6500. The population to be served is something like 3000 people. The supply will be taken from the existing Plympton works.

Proposed Water-Works Extension at Cardiff.—The Engineer of the Cardiff Water-Works (Mr. C. H. Priestley) has submitted to his Committee a report dealing with the questions of the desirability of extending the Heath filter-beds, and also constructing new service reservoirs for the storage of the high-level supply. His estimate for three filter-beds, cottage, new sand-washing apparatus, cast-iron mains, and boundary wall and fences, is £12,900; for one reservoir at Penylan, land (including that for second reservoir), stand tower, turncock's house, mains, walls, &c., £14,900; for the completion of No. 2 filter at Rhubina, £150; and for engineering and law costs, £1677—a total of £29,627.

Water-Works for West Bridgford.—West Bridgford, which is a rapidly increasing suburb of Nottingham, has, through its District Council, made up its mind that the time has arrived when it should have a water supply independent of the Nottingham Corporation. The Council have therefore consulted Mr. W. H. Radford, who has advised them to put down works at an estimated cost of £12,500, exclusive of engineering fees, cost of land, and purchase of mains from the Corporation. The Council have decided to sink a borehole, the cost of which will be £450. If the trial is successful, an application will be made to the Local Government Board for sanction to undertake the work.

Redruth Water Supply.—At the last meeting of the Redruth District Council, it was decided to apply to the Local Government Board for power to borrow £1500 for carrying out certain works in connection with the water supply of the town. The Water Committee have, as our readers are aware, been much exercised over the condition of the reservoir, which is not water-tight. An offer had been received from Mr. Delbridge to put it right for £510, on condition that he is not subject to any penalty or fine on the existing contract. The Engineer advised the acceptance of this offer; Mr. Delbridge not to be paid anything till December, 1897, and then only if the work was satisfactory. This was agreed to.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., on the 29th ult., Messrs. Fox and Bousfield sold portions of King's shares in the New River Company at the rate of £102,400 per share. Some consolidated "A" stock of the Croydon Gas Company was recently sold by auction, and realized at the rate of £330 to £344 per £100; £300 of consolidated "C" stock fetching £212 per £100. Some £10 shares in the Chatham, &c., Water Company were lately sold for £15 8s. and £15 10s. each. The following shares were lately sold by public auction at Norwich: 37 £10 ordinary shares in the City of Norwich Water Company, at an average of £20 each; and £350 of the East London Water Company's 4½ per cent. debenture stock, at an average of £170 per £100.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

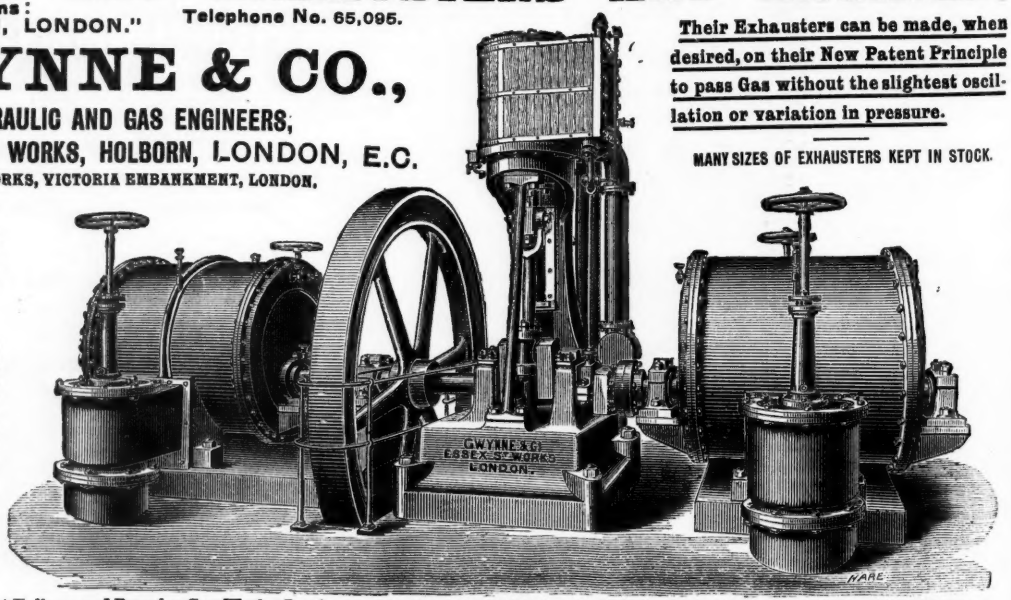
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.
ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.
Telegrams: "*Volcanism, London.*"

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 198, last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

NOTICE OF REMOVAL.

R. ANDREWS, Practical Retort Setter, HAS REMOVED from Sugden Road, Lavender Hill, to 9, JESSICA ROAD, WANDSWORTH COMMON (West Side), LONDON, S.W.

AN Englishman, with high credentials, resident in France over Twenty years, wishes to negotiate AGENCIES for the sale of British Wares and Products in France.
DAVIES, 18, Rue La Fontaine, PARIS.

WANTED, by a practical experienced Man, a Situation as FOREMAN or INSPECTOR. Well up in Mains, Services, Meters, Stoves, and House Fittings, and able to give Estimates. First-Class Testimonials.
Address A.B., 11, Mission Grove, High Street, Walthamstow, LONDON.

WANTED, by a middle-aged Man, a Situation as MANAGER of Small Gas-Works (Public or Private). Can fix Meters, and lay Mains and Services. Twenty Years' Experience. Good References.
Address No. 2692, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a good Stoker, used to Shovel Charging, Engine and Exhauster, and willing to make himself generally useful. To a Steady and Industrious Man, a permanency. Salary 24s. 6d. in Summer, and 26s. 3d. in Winter.
Apply, with Reference as to character, to the MANAGER, Gas-Works, Chepstow, MON.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making. Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

It is Worth Your While to Buy DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.
RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.
Depôts at Liverpool, Bristol, Hull, Glasgow and Newcastle-on-Tyne. Telegrams: "Subastral, London."

WANTED, a Stoker used to Shovel Charging. Must be an Abstainer; no other need apply. Wages 24s. 6d. per week.
Applications to the MANAGER, Gas-Works, New Tredegar, MON.

WANTED, at once, a good Stoker for small Country Gas-Works. Constant Employment. Wages 21s. per week.
Apply to the MANAGER, Gas-Works, West Malling, KENT.

WORKING MANAGER.

WANTED, by the Chatteris Gas and Coke Company, Limited, a practical WORKING MANAGER. House, Coal, and Gas found. Wages, £70 a year.
Applications to be sent to
WILLIAM HENRY CLARKE,
Secretary.

WANTED, Two Tank-Trucks for carrying Tar, for Hire or for Hire Purchase.
Apply, with full Particulars and lowest Terms, to No. 2693, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Second-Hand Gas-HOLDER and TANK, about 40 feet diameter, by 16 feet deep.
State lowest Price, and where to be seen, to No. 2691, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WIDNES CORPORATION GAS AND WATER WORKS.

GAS PLANT, &c., for Sale—Annular CONDENSER, MANN and WALKER TOWER SCRUBBER, 38 ft. by 8 ft., and a WALKER PURIFYING-MACHINE of 1 Million Cubic Feet capacity per diem. The Valves and Connections for the above are 12 inches diameter.
Particulars may be obtained on application to Mr. ISAAC CARR, Assoc.M.Inst.C.E., Gas-Works, WIDNES.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SPENT OXIDE Wanted.
J. HARDMAN, Milton, STAFFS.

SULPHURIC ACID for Sale (B. O. V. and R. O. V.) made from Spent Oxide.
J. HARDMAN, Chemical Works, Milton, STAFFS.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

THE LAW GUARANTEE & TRUST SOCIETY, LD., GUARANTEES FIDELITY.

SEND for complete Prospectus con-taining Balance-Sheet, Copy of Policy, &c., &c. Mortgage, Debenture, License, and Contingency Insurance.
Head Office: 49, CHANCERY LANE, LONDON, W.C.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

ROBERT DARNEY, of Faversham, Kent will be glad to receive OFFERS for Ten SHARES in William Sugg and Co., Limited.

A COMPLETE Gas Plant for Sale cheap. Also GASHOLDER, 45 ft. by 14 ft. PURIFIERS, sets of Four, 7 ft. by 4 ft.; 12 ft. and 14 ft. square; and two 8 ft. square. Kirkham WASHER. Engine and Pump EXHAUSTERS (Dempster's). ROTARY EXHAUSTERS; and other new and second-hand APPARATUS ready for delivery. Inquiries solicited.
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE, Second-hand—
(1) STATION METER (Makers, Gas-Meter Company, Oldham). Age 9½ Years. Six-inch Connections, with 6-inch Valves to Inlet and Outlet, and Syphon Bye-Pass. Will pass 4000 cubic feet per hour.
(2) EXHAUSTER (Makers, Dempster), 4-inch Connection from 6-inch Main, Governor, Self-Acting Bye-Pass, and necessary Fittings. Will pass 3500 cubic feet per hour.
Apply to W. T. LAWRENCE, MILLOM.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LIMITED.

THE above Company have for Sale—
Two STATION METERS, 1200 cubic feet per hour, and 3600 cubic feet per hour, with Valves.
One 8-inch GOVERNOR, with Valves.
One 8-inch FOUR-WAY RACK-VALVE.
Two 8-inch FOUR-WAY CENTRE-VALVES.
Nine 20 in. by 14 in. ⌂ MOUTHPIECES.
Two Self-sealing MOUTHPIECES, 20 in. by 14 in.
HYDRAULIC MAIN, Wrought Iron, 14 in. by 14 in., suitable for three Beds of five Retorts.
Twelve 14 in. by 12 in. ⌂ MOUTHPIECES, with Lids and Screws complete.
Seventeen 4-inch H and DIP PIPES.
Fourteen ASCENSION-PIPES.
For further Particulars, apply to
JAMES DOUGALL,
Engineer and Manager.
Gas-Works, Hoylake,
July 25, 1896.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for SPENT OXIDE.

Specification and Form of Tender may be obtained from Mr. Whatmough, Gas Manager.

Tenders, endorsed "Spent Oxide," to be sent to me not later than Tuesday, Aug. 18, 1896.

By order,
A. B. PILLING,
Town Clerk.

Municipal Buildings, Heywood,
Aug. 1, 1896.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for SULPHURIC ACID, and TUBES and FITTINGS.

Specifications and Forms of Tender may be obtained from Mr. Whatmough, Gas Manager.

Contractors tendering for this work must pay their workpeople at least the standard or trade union rate of wages, and observe the trade conditions which attach to the various kinds of work for which the tender is sent in.

Sealed and endorsed tenders to be sent to me not later than Tuesday, Aug. 18, 1896.

By order,
A. B. PILLING,
Town Clerk.

Municipal Buildings, Heywood,
Aug. 1, 1896.

SMETHWICK GAS-WORKS.

CARBURETTING OIL.

THE Gas Committee invite Tenders for the supply of about 6000 Gallons of SPIRIT OIL, ·700 specific gravity, for delivery in Barrels at the Gas-Works, Rabone Lane, Smethwick, during the period ending the 30th of June, 1897, to be equal and guaranteed to sample to be submitted.

Tenders, addressed to the Chairman, and endorsed "Tender for Oil," to be delivered to the undersigned not later than the 18th of August inst.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
W. J. STURGES,
Secretary.

Public Buildings, Smethwick,
Aug. 1, 1896.

COUNTY BOROUGH OF WIGAN.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Wigan Corporation invite TENDERS for the surplus TAR produced at their Gas-Works, for One Year, commencing on the 1st of September next, and terminating on the 31st of August, 1897.

Particulars and Forms of Tender may be obtained on application to the undersigned.

The highest or any tender not necessarily accepted.

Tenders, sealed and endorsed "Tar," to be delivered to J. J. Charnock, Esq., Town Clerk, on or before Tuesday, the 18th inst.

JOS. TIMMINS,
Engineer.

Borough Gas-Works, Wigan,
Aug. 1, 1896.

STOCKTON-ON-TEES CORPORATION.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Corporation invite TENDERS for the supply, in whole or in part, of 32,000 Tons of GAS COAL for the Year ending Sept. 30, 1897.

Particulars and Form of Tender can be obtained on application to the undersigned at the Gas-Works.

Tenders, sealed and endorsed "Tenders for Gas Coal," to be sent in not later than Noon of the 26th day of August, 1896, addressed to M. B. Dodds, Esq., Town Clerk, Stockton-on-Tees.

The Gas Committee do not bind themselves to accept the lowest or any tender.

WILLIAM FORD,
Engineer and Manager.

Gas-Works, Stockton-on-Tees,
Aug. 6, 1896.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for about 600 Tons of large through and small GAS COAL, to be delivered between the 1st of September, 1896, and the 1st of September, 1897. The whole of the Coal to be Fresh Hewn, Clean, and free from Impurities.

Further Particulars and Forms of Tender can be obtained on application to the undersigned.

Sealed tenders, endorsed "Tender for Coal," addressed to the Chairman, Gas and Water Committee, to be sent in not later than the 18th of August next.

The Council do not bind themselves to accept the lowest or any tender.

By order,
THOMAS H. LEWIS,
Clerk.

Milford Haven,
July 31, 1896.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 20th day of August inst., at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare Dividends, to elect an Auditor, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 20th of August, 1896, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley,
Kent, Aug. 6, 1896.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the supply of COAL for a period of Twelve Months from the 1st of October next, to be delivered, as from time to time directed, by and at the expense of the Contractors, f.o.b. at Keadby, or at the Pits, or at the Railway Station, Beverley, according to the terms of contract.

The Coal to be of the best kind, well screened, free from Sulphur, Bats, Bind, Refuse, and Dirt, and to be weighed (21 cwt. to the ton) upon the Corporation Machine.

Payments will be made monthly, so long as the Contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any tender.

Further Information may be obtained of the Gas Manager (Mr. James Gibson) at the Gas-Works, Beverley; and tenders, endorsed "Tender for Coal," must be delivered at my Office not later than Monday, the 24th of August, 1896.

By order,
J. WILLIS MILLS,
Town Clerk.

Guildhall, Beverley,
July 31, 1896.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT, 1867.)

NOTICE is Hereby Given, that the FIFTY-NINTH ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 25th day of August, 1896, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 10th inst. until after the Meeting.

By order,
BENJAMIN GREEN,
Secretary and Manager.

Offices and Works: Western Road,
Mitcham, Aug. 4, 1896.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 29th day of August inst., at Half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June, 1896, to declare Dividends for the same period, and for the election of two Directors and an Auditor for the ensuing Year; also to consider the NOTICE OF MOTION given at the Half-Yearly Meeting held on the 29th of February last, as follows: "That, at the next General Meeting of Proprietors, the Salary of the Secretary be considered, with a view to its increase;" and for transacting General Business.

The TRANSFER BOOKS WILL BE CLOSED for the Consolidated Stocks from the 14th to the 29th of August inst., both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 7, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c. apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed,

Samples and Prices on application.

5 PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . .	11,205 Cubic Feet.
Illuminating Power,	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. Per Ton.
Sulphur	A little over 1 Per Cent.
Ash	Under 1 Per Cent.
Tar	163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . .	10,500 Cubic Feet.
Illuminating Power .	17 Stand. Sperm Candl.
Coke (of excellent quality) .	13½ Cwt. Per Ton.
Sulphur	1·13 Per Cent.
Ash	1·34 Per Cent.
Tar	180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT, WHETHER MAKERS, WHOLESALE DEALERS, RETAILERS, or USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,

Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad St., E.C.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

LITTLE & GRAHAM, Ld.
THE
INCLINED RETORT
SPECIALISTS
TRANSPORT APPLIANCE WORKS,
SMETHWICK,
BIRMINGHAM.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

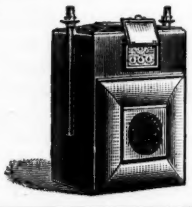
Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
Coal Owners, Newcastle-on-Tyne;
or
E. FOSTER & CO.,
12, John Street, Adelphi, London, W.C.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS,
MILTON HOUSE WORKS, EDINBURGH.
LONDON. — GLASGOW. — LEEDS.



GASEOUS FIRING A SPECIALTY.
Telegraphic Address:
"DRAKESON, HALIFAX."
Telephone No. 43.
HALIFAX EXCHANGE.
GAS ENGINEERS.
RETORT SETTERS.
IRONFOUNDERS.
CONTRACTORS.
FURNACE BUILDERS.
&c. &c.
SOLE MAKERS OF
"MITTON'S"
PATENT SELF
SEALING
RETORT-LID.
SOLE MAKERS OF
"SETTLE'S"
PATENT COMBINED
SEAL-REGULATING
FLUSH-VALVE.
JONAS DRAKE & SON.
SOLE AGENTS
For
"HISLOP'S"
PATENT REGENERATIVE
FURNACES.
FOR ENGLAND, WALES & ABROAD.
OVENDEN, HALIFAX.
London Office:
60. QUEEN VICTORIA ST., E.C.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.

ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.

MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

JOHN BROWN & CO., Ltd., Sheffield.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

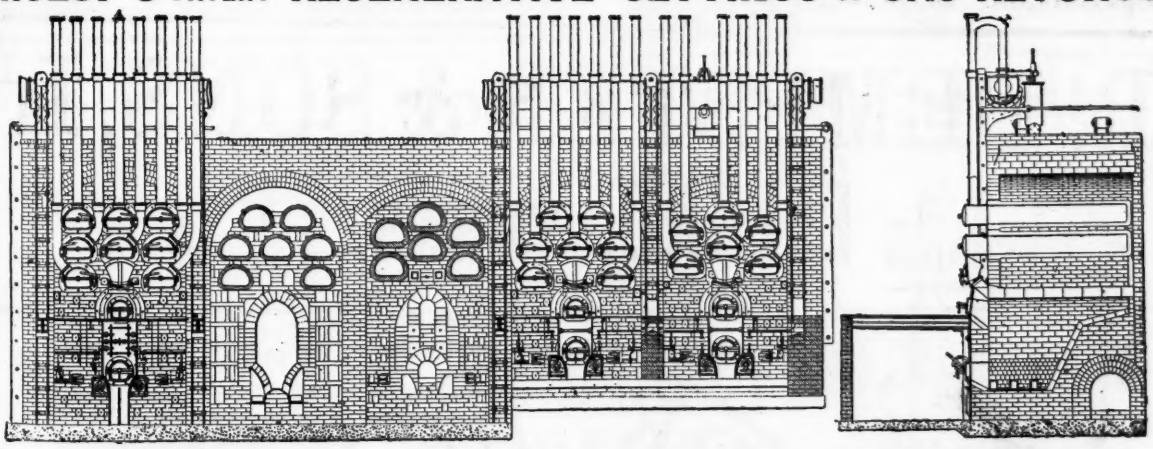
Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 28 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non.*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

R. & A. MAIN,

GAS COOKING AND HEATING STOVES,

92, ALDERSGATE STREET, KINNING PARK,

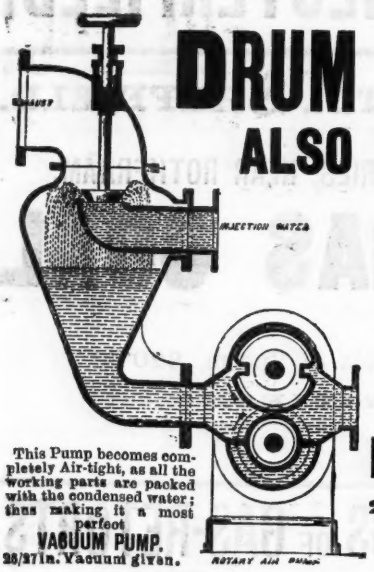
LONDON, E.C., & GLASGOW.

"The Force of the Piston Pump with the Capacity of the Centrifugal combined."

JOHNSON'S PATENT

DRUM PUMP AND EXHAUSTER

ALSO VACUUM PUMP AND CONDENSER.



This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect

VACUUM PUMP.

28/27in. Vacuum given.

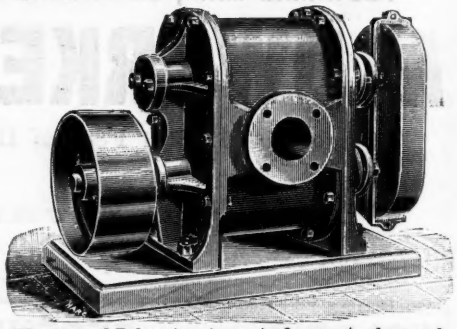
No Priming, Valves, or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

DRUM ENGINEERING Co.

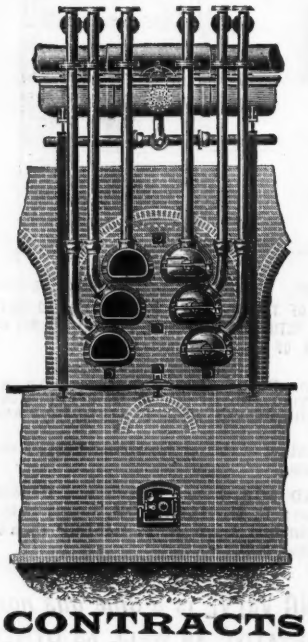
27, CHARLES ST.,

BRADFORD.



Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 3 lbs. and upwards, and this without losing power by creating frictional Heat.

R. DEMPSTER & SONS, L.D.

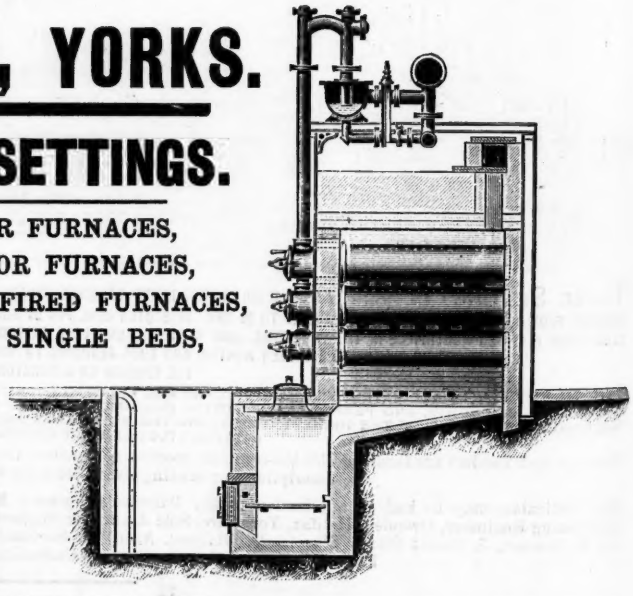


ELLAND, YORKS.

RETORT-SETTINGS.

GENERATOR FURNACES,
REGENERATOR FURNACES,
SIMPLE DIRECT-FIRED FURNACES,
THROUGH & SINGLE BEDS,
SUITABLE FOR

LARGE
OR
SMALL
GAS-WORKS.



CONTRACTS FOR COMPLETE INSTALLATIONS.

GIVING THE HIGHEST WORKING RESULTS, THE MOST PERFECT HEATING, GREATLY INCREASED DURABILITY, THE LOWEST FUEL CONSUMPTION.

PLANS AND ESTIMATES ON APPLICATION.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 „	Preston	1,500,000 „
Glasgow	300,000 „	Southport	750,000 „
Brussels	700,000 „	Bath	1,000,000 „
Liverpool	3,500,000 „	New York	1,200,000 „
Tottenham	750,000 „	Newburgh, N.Y.	350,000 „
Santiago	400,000 „	Tottenham (Second Contract)	750,000 „
Swansea	750,000 „	St. Joseph, Mo.	750,000 „

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Edinburgh	2,000,000 Cub. Ft
Shanghai	225,000 „	Stockton-on-Tees	500,000 „
Winchester	200,000 „	Stockport	500,000 „
Hoylake	125,000 „	Norwich	1,000,000 „
Manchester	3,000,000 „	Guildford	350,000 „
Brussels (Second Contract)	700,000 „	Syracuse, N.Y.	850,000 „
Holyoke, Mass.	600,000 „	Bordentown, N.J.	125,000 „

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

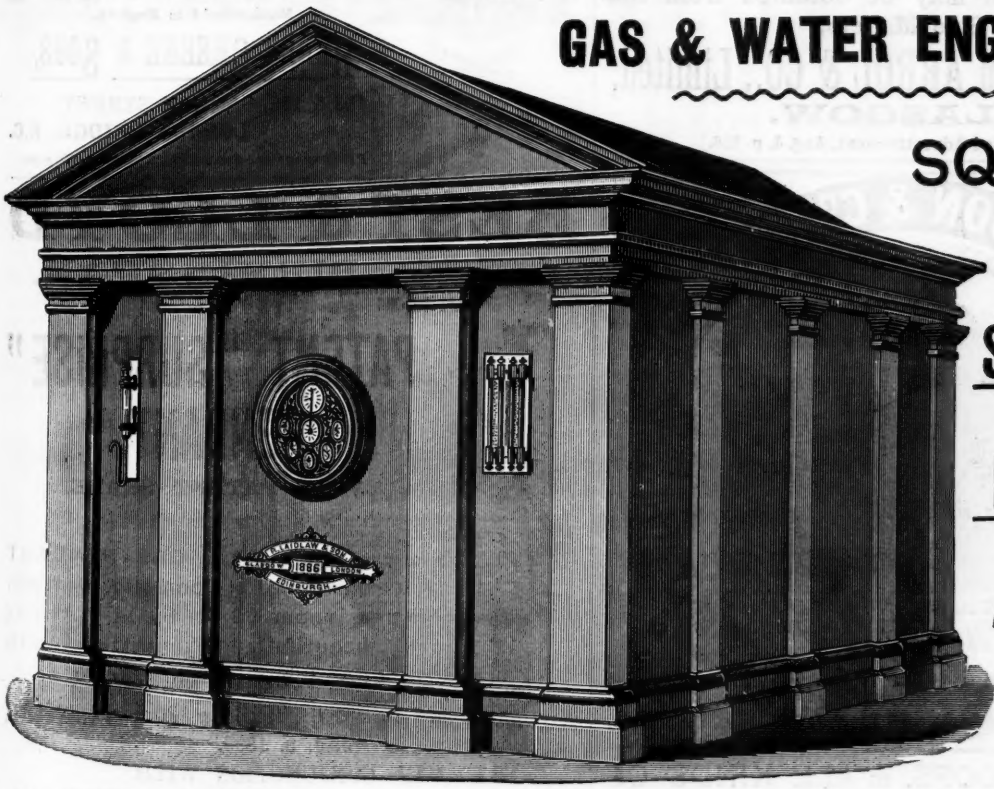
9, Victoria Street, London, S.W.

Telegrams: "EPISTOLARY, LONDON."

United States Office, 64, Broadway, New York.

R. LAIDLAW & SON

GAS & WATER ENGINEERS.



SQUARE

(OR ROUND)

STATION

METERS

ALL SIZES.

SIMON SQUARE WORKS, EDINBURGH. | ALLIANCE FOUNDRY, GLASGOW. | 6, LITTLE BUSH LANE, LONDON.

STOURBRIDGE
RETORTS AND FIRE-BRICKS.
BEST QUALITY.

KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, Aug. 4, p. 240.]

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

OXIDE OF IRON.
NATURAL BOG ORE FROM OWN MINES.
Samples and Prices on application.

Wm. H. MÜLLER & CO.,
81, PALMERSTON BUILDINGS, LONDON, E.C.
TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Aug. 4, p. 236.]

MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
SPECIALITY
IT IS 300 FT DIAS. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.
London Office: 60, QUEEN VICTORIA STREET, E.C.
Telegraphic Addresses: "GAS LEEDS," "ECLARAGE, LONDON."

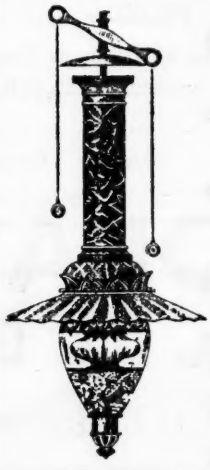
WILLIAM INGHAM & SONS,
Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS,
AND ALL KINDS OF GAS-WORKS APPARATUS.
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

The Climax of Regenerative Gas Lighting!!



THE
"VERTMARCHE"
A 280-CANDLE POWER PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

HENRY GREENE & SONS,
153 & 155, CANNON STREET, LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

BEST & LLOYD
MAKERS OF THE **BIRMINGHAM.**

PATENT "SURPRISE" PENDANT,
WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.
"IN CONJUNCTION WITH
THE INCANDESCENT GAS-LIGHT,
it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
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